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L. Lesquereux Columbus O.
Bound May 1871

729

Remarks & species to be added to my MS.s for correction

1. Callipteridium crocquetae from a new specimen p. 397 & A.
2. Dictyopteris Scheuchzeri Roem Verst. b. Dig 3 c 1.
3 Neuropteris Rogersi Ill. Rep IV p. 382 & 2.
4 Hymenophyllites dense-clus sa Manfield Plants Ma 490 in Catalogue
5 Cyclopteris oblata Al Hf. à probably that described as Neuropteris dilatata Al Hf
(in my mss, compare Al Hf v III pl 217.
6 Neuropteris obtusifolia Ill Rep IV p 407 pl 2/
7 Alethopteris anthracina Heer in Catalogue of Manfield n° 489.
8 Pseudopecopteris irregularis. Refer to this Sphenopteris? described p. 416 f 2 from Ma 514
9 " macilenta. given to the b. neuropteris, also in explain IV p. 416 c. 1.
10 " trifoliata
11 " obtusiloba

~~GB See Wood for a Odontopteris~~

Section to be made for the coal flora
Ind. for coal. also subcarboniferous mantle along the Whetstone

p. 509, 510

Questions to be considered in the plan pr 476

Neuroptera number of species per centum mile, p 322 b.

Geological Survey of Illinois.

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Vol. IV

Part II.

Palaeontology of Illinois

Section II.

Report on the fossil plants of Illinois

By Leo Lesquereux.

1870.

pl. V. – XXXI.

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National Museum.

See where this genus has been described and what are its characters. The genus does not appear to have been described at length by what Andrews says in this Report that the genus was established by Dawson to include a form of Devonian fern named Neuropteris Dawsoni by Hall. The name is good and the genus is distinct. Ferns of very large size. Fronds simply pinnate one to two feet long or more, pinnae or leaflets alternate upon a stout half round rachis decurrent, linear lanceolate gradually narrowed to a point or acuminate or otherwise pointed, the upper ones dividing in the middle or from the base sometimes into two or three leaflets; veins very close oblique, at first coming out at an acute angle of divergence from the broad midrib then passing to the border in a less oblique divergence and turning upwards to reaching the border Fig 1. of my plate show the upper part of a frond, Fig 2 the middle Fig 3 seems to differ at least by the more obtuse and broader lobes though the nervation is the same. I do not have seen the specimen however, my figure is made from a sketch of Mr Southwell.

1 Megalopteris Southwelli; Hobbs. For the characters of the genus differs from the species published by Andrews by its slender form, the caudate acuminate leaflet, the nervation very thin but distinct. The epidermis of the leaves is a waxy white as thick as common writing paper upon which the surface is marked as somewhat granular by irregularities crossing the veins about a right angle. It may be that fig 1 represents a whole frond in the process of development or perhaps a different species, as the base of the lower leaflets is not decurrent and continuous as in fig 2 but passes to a border of the rachis marked by parallel lines and not by veinlets. The difference also between these rachis and midrib of these two species seems too great for supposing them identical. I propose therefore to name the 1. Megalopteris fasciculata. 2 M. Southwelli. The nervation is the same in both species somewhat the different, the veinlets in 2 being more distant and thicker. Fig 3 may be named M. curviloba? or something like. None of the figures of Dawson or of Andrews show the nervation (some drab) distinct as in my figure. Comparing the fragment of Megalopteris which I have and also those described and figured by Dawson. the average length of the leaflet is six times the length of their width. This can be seen in my fig 1. Now I have a sketch from Southwell which represents fragment of a leaflet 11 ½ cent wide and therefor the length should have measured about 70 centimeters. The midrib is 6 millimeters broad, the veins very distinct and of course more distant than on my figure; at least so says Southwell. The character of nervation is however the same. The veinlets are very thin but very distinct, averaging at the borders three per millimeters or 16 to 17 per 5 millimeters of space; generally forking once at the base or simple at the border and forking once at the middle rarely above, passing from the border to reach the midrib at an angle ranging from 55 to 65. the veins being more oblique toward the point of the leaflet and nearly horizontal or at right angle to the rachis at their decurrent base and joining the midrib by abruptly curving downward and reaching it in an angle of about 30°. See borders of leaflet in Smith Pl III fig. a.

1 Calamites approximatus Ref. from p. 371 (1). Another specimen of Lacuna 589 a.
Gent long flattened 3 cent broad No. the articulation without inflation, very short
and irregular in width, from 6 to 10 mill broad, thin bibiferal low ridges of branch
very few and irregular.

1. Dictyophyllum Ll & Hutt. Part of the Phlebopteris described by Brongniart are referred by Schimper to this genus. See how it is characterized. I have from Mazo creek a nodule dy 1889 representing a small new species of this genus which may be named Phlebopteris or Dictyophyllum Shorti: H. sp. a small leaf 4 cent long broadly obovate, enlarging upwards from the base, round truncate at the top when it is three centimeter broad, apparently entire or not lobed, with border somewhat recurved. It has from the base a strong midrib, two millim broad, with alternat branches like lateral nerves of a dicotyledonous leaf going out at an acut angle of divergence of 40°, curving backwards on one side and inward on the other becoming thin and effaced toward the border, irregularly crossed by areolae, large with thick parallelogrammic obtuse alternate oblique to the primary or large nerve, somewhat similar to nervilles. A good figure should be made of this remarkable leaf.

FOSSIL PLANTS.

INTRODUCTORY REMARKS.

The generic classification of the species of fossil plants, enumerated and described in this paper, is the same as that in the second volume of this Report. Perhaps it would have been advisable to modify, by subdivision, a number of our genera, especially for some species of ferns, of which we have recently obtained fruiting specimens, which seem to indicate a relation to peculiar species of the present time. But as this Report is a mere continuation of the first, a change of classification would have rendered it more obscure to the student, and would have required a long discussion on the value of some of these new genera, without any advantage to science. For the fructifications of the fossil ferns are scarcely, if ever seen, except obscurely, through the substance of the leaflets under which they are attached, and even when the position of the *sori* or groups of fructifications relatively to the veins and veinlets, or to the borders of the leaflets can be ascertained, their true form, and especially the mode of attachment and of dehiscence of their *indusium* cannot be recognized. The natural affinity of these fruiting fossil fragments is, therefore, always more or less uncertain, and a mere change of name, without sufficient authority, tends to obscure, rather than to enlighten the classification. I have, therefore, merely appended some remarks to all the species, which, by their known organized parts, may differ in some way from the characters of the genera to which they are united. I have also, in this paper, omitted to repeat descriptions of genera and of species already given in the second volume of the Report, but have added to the names such remarks as have been suggested by the discovery of more complete specimens. In botanical palæontology, we have to deal merely with fragments, and none of these separate fragments are sufficient, in themselves, to indicate the general character of the whole plant to which they belong. The discovery of each part of a fossil plant adds, therefore, to our acquaintance with a species, and the record and description of any of the separ-

ate members, are often of more value to botanical science, than the description of so-called new species, established on some remains of a peculiar form, and of unknown relation.

The number and diversity of the plants published in this volume, tend to indicate the richness of the fossil flora of our Coal Measures, and at the same time, show an increasing activity in research.

The publication of the fossil flora of the second volume of the Geological Survey of Illinois, has excited a remarkable interest for botanical palæontology. Not only private gentlemen have given their time to the collection of specimens, but local societies have been formed for encouraging research, and founding cabinets of fossil plants. We can therefore hope soon to see our fossil flora in America as thoroughly studied and as well known as that of Europe, where this field of science has been ardently worked for more than a century.

Among those to whom the survey is especially indebted for the communication of valuable material used in the preparation of this Report, thanks are due to Mr. Jos. Even, of Morris, who, after the loss of his valuable cabinet by fire, has begun again his researches with renewed zeal and great success; and to Mr. S. S. Strong, of the same place, who has most liberally presented the State Cabinet and myself with a large number of specimens of rare and new species. Messrs. M. Prendel and John Collins, also of Morris; Mr. M. S. Hall, formerly of Wilmington, and Mr. Thos. Tijou, of Duquoin, have also furnished valuable contributions to this Report. As, moreover, the assistants of the State Geological Survey were instructed by the State Geologist carefully to look for and preserve specimens in their explorations, and as the Director of the Survey and myself worked hard in collecting specimens as often as opportunity permitted, the amount of materials which have been examined for this report, and which now mostly belong to the State Cabinet in Springfield, are extensive and of great value.

+ 1 Callipteridium, Weiss. see Schimper III p. 430 for description of this genus which is a very good one for the species which I wanted to place in Callipteris a Callipteridium. My C. Jourdei is closely allied to if not identical with Neuropteris oralo Germar for III pl XII which is a Callipteridium, and it will be scarcely possible to separat it. It has only longer leaflet oblong oblong, generally turned upwards and no perpendiculare to the rachis, the terminal pinnule of the penna long gradually narrowed to an obtuse point and the veinlet not flexuous as figured by Germar. Then veinlet are also much closer more numerous thinner and more distinct. This is far different from Neuropteris oralo Bgt.

+ 2 C. (Callipteridium) neuropteroides Gpt. 1862 (figured) from Mayor creek. Closely allied to Neuropteris Gigantea Bgt. and Callipteris conferta of authors. The species or var. has the same kind of nervation but the leaflet are not decurrent, nearly in right angle to the rachis and obtusely pointed, proportionally longer and narrower than in all the European figure of this species. As this form is extremely variable, it may be an American variety, name it Conferta var. Americana and figure if possible. The leaflets are thick, ~~and~~ coriaceous the nervation coarse and distinct. ~~Nearest to be compared to what I have described as~~ veinlet thick ~~C. crenulata~~ Presl, a species which the Europeans consider the same as Callipteris conferta, so far different from it, at least in regard to the specimens which I have named thus. I have a large number of them for ex. 1848, S. 28 Feb. Fig. a true callipteris a pecopteris with narrow leaflet and nervation very distinct, the veins only forked once alternately distant thin but distinct, all coming out from the midrib. see p. 378 b. 1. Fig 1d 1a.

+ 3 Callipteris Mansfeldi. Is now Represented by No. 36, 5 evidently closely allied C. Jourdei. But it differs by much larger leaflet oblong lanceolat obtuse, very the shaped upwards distinctly so. The nervation is about the same, but the veins very thin but distinct and deeply impressed forking generally twice. The leaflets are attached to the rachis by the whole base and distinct to near the rachis where they join in an obtuse sinus: — Comparing it again to C. Jourdei, the difference is scarcely noticable except for the very the shaped form of the leaflets. The nervation is the same. In both the veinlet forks twice, once near the base and once of the forking branches forking again. In C. Mansfeldi the surface is not shining though from the small specimen it is seen to be coriaceous and inflated as in C. Jourdei. Fig 2 is also pteroides in character, the nervation is however much coarser.

+ 4 Callipteris Jourdei. CB. 41. N. 155 The under part of the specimen which is also figured like the other side shows the upper part of a penna with the lower pinnules more distinctly attached to the rachis, not only are they ~~very~~ attached to the Rachis in their whole width but their lower part is prolonged decurrent and nearly to the base of the upper pinnule of the inferior roundish pinna. This character is very remarkable and distinctly referring Callipteris Mansfeldi to the same. What I said above of the relation of these two species is right. One pinna on the reverse shows the leaflet also subfalcate and broadly obtuse just of the same forms as in C. Mansfeldi but only half as long and broad.

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1. Callipteridium neuropteroides spec. nov. I do not thinkt that it may be compared to C. conferta thought the nervation may be somewhat like. The lateral nerves are not very much curved, either very thick as by inflation of the epidermis similar to that what is remarked upon leaves of Neuropteris, or very thin thought distinct where the epidermis is destroyed. both these forms or casualties are marked upon fig. 3 & 3a enlarged of the Callipteris plate. The leaflet are either joined near the base or disjointed to the base and then their border base is slightly curved inside thought really sessile. The character is therefore Neuropteroidal, Pecopteroidal and Alethopteroidal.

2. Callipteridium membranaceum spec nov (Pl XVI d) fig. 4–7. Frond poly pinnate. pinnæ pinnately divided in (fig 5) simple oblong obtuse undulate large pinnuls in right angle to the rachis or slightly turned upwards, either attached to the rachis by their whole length, either joined at the base or separate and then the leaflet slightly rounded on both sides at the base. The leaflets average twelve to fourteen millim long and 5 mill. broad. or as in fig 4 the pinnæ are divided in narrower thought slightly longer pinnuls. The lower ones disjoin sed at base but semi by their whole base rounded at both sides of the base or slightly decurrent by the lower, alternately obliquely and equally short lobed. The lobes becoming less marked in passing up toward the point and the upper pinnuls being entire, or as fig 6–7 the pinnæ are bipinnately divided the primary division being linear, of various length pinnately divided. leaflet short oblong roundotuse which become shorte and smaller in the upper part of the pinnæ. All these divisions are exactly pecopteroidal – but the nervatio is evidently of Callipteris. This nervation when the specimen are bothed dry is not seen at all even scarcely perceptible with the thron glass, but when the specimen is moistened with the tongue the veins black and thick become perfectly distinct through the reddish transparent substance of the plant. The nervatio is exposed in 4c 5a, 6c 7c. enlarged and is exactly as seen upon the plant fig 5 c. The midrib is very thick and abruptly terminates toward the point of the leaflets as in C. villerantii. This appear to be a character of Callipteris. We have I thinkt to preserve it and to include into el. C. villerantii. But the definition would be amended. Remark that the plat represent the plant as it is when seen in it fossil dry stat. the veins being invisible and that the enlarging parts represent the pigment as seen enlarged double when moistened and pellucid.

General remarks on ferns.

1. See for difficulty of comparing them to Thomson's time Brongn. on Grand'Eury memoire p. 3. (1). On the large fronds of Neuropteris and Odontopteris same page (2)

[illegible] to species to be named. Fig 3. p. 545 is copied from a Saint-Etienne [illegible] feat [illegible] Cordaites which is already [illegible] not known. The plant is whorled; cauline [illegible] known in exact mode. Foliar [illegible] distichous [illegible] with an [illegible] opposing [illegible] [illegible] curved inward. The fructification is small and sometimes the whole [illegible] is [illegible] Nothing of nervation is [illegible] a kind of Fucoidal plant. But more intimately [illegible] than any other known. It may be compared to a fucus [illegible] (Le Mans).

DESCRIPTION OF NEW SPECIES, AND AN ENUMERATION, WITH REMARKS, ON SPECIES ALREADY KNOWN.

FUCOIDES, OR MARINE PLANTS.

Genus CHONDRITES. Sternb., Vers. 2, p. 25.

Frond cartilaginous; stem filiform, dichotomous; branches cylindrical.

Chondrites Colletti, Sp. nov.

Frond large, dividing fan-like into numerous crowded branches, dichotomous, either diverging on both sides of the main axis or arched on one side; ultimate divisions simple, linear, cylindrical, with irregular borders.

This species is not as yet satisfactorily known. I have but recently received from Mr. John Collett, Eugene, Ind., some specimens of a black, fossiliferous limestone, whose surface is marked with the remains of these plants, true Fucoides. The species distantly resembles, by the curving of its branches, *Fucoides cauda galli*, Van. But it is evidently a compound of separate branches, dichotomous from near the base of the frond (the base is broken from the specimen), the branches in dividing and ascending, forming fan-like or flabellate fronds. The branches, which are ultimately simple, leave upon the stone a half cylindrical impression, and are distinct from each other. The locality is indicated as Towle's mill, five miles east of Lodi, Ind., and the geological position about the level of coal No. 1 of the Ill. section. If it is so, this black

fossiliferous limestone, whose characters are so much like those of the Penna. black limestone seen at the top of the millstone grit with *Caulerpites marginatus*, Lesqx., Jour. Am. Phil. Soc., vol. 13, p. 313, occupies the same level. This is a peculiar coincidence of a singular formation, which, exceptionally in the flora of the Coal Measures, contains Fucoides, in both the coal basins of Penna. and of Illinois.

FRONDS AND BRANCHES OF FERNS.

Genus NEUROPTERIS, Brgt.

This genus, limited as it is, vol. ii, p. 427 of this Report contains some species, whose leaflets, more generally round, have no distinct medial nerve, and which, from this peculiarity of form and nervation, are referable to the genus *Nephropteris*, Brgt., already a modification or subdivision of the genus *Cyclopteris*, of the same author. As some of our species are represented, even on the same specimens, by fronds bearing both oblong leaflets with a well marked medial nerve, and nearly round ones without it; or by branches bearing round or polyform pinnules with a definite medial nerve, and oblong ones without a trace of it, the subdivision of the genus *Neuropteris* is as difficult as it is inconvenient, with the materials now at hand. This opinion is further supported by the descriptions and figures of some of our species.

Neuropteris hirsuta, Lesqx.

Boston Jour. of Nat. Hist., 1854; State Geol. Rept. of Penna., p. 857, Pl. iii, 6*f*, Pl. iv, fig. 1 to 16, excl. syn.

The degree of relation of this species with *Neuropteris cordata*, Brgt., is not yet ascertained. In his admirable work on the Fossil Flora of the Permian (1864–65) p. 100, Pl. xi, fig. 1 and 2, Prof. Goppert has published as *Neuropteris cordata*, Brgt., part of a pinna, bearing on one side of its broad rachis a series of alternate, oblong, cordate, obtuse leaflets, one inch broad, four inches long, marked with a thick medial nerve, and on the other side diminutive leaflets, very short and enlarged, resembling, according to the author's remarks, some of those of the polymorphous *Neuropteris auriculata*, Brgt. If the true *Neuropteris cordata* has such leaflets of various forms alternately attached to a

Neuropteris hirsuta Lesq. See note on the hairs p: 509. – One specimen N. 187 shows upon its surface round concave elevated spots which appear like Epiphyllae. Their size and position is too irregular to permit the supposition that they represent fructification. See also N. 133. for an oval elongated excrescence upon the leaflet much resembling a sphoria or some other genus of epiphyllae.

Neuropteris Rogersi Lesq. Penn: Geol. Rep: 1856. pl 7. fig. 2. Neuropteris Speciosa Lesq. Bost. Soc: of Nat. Hist. proceed: Oct: of fossil plants of the U. S. 1858.

Frond unknown. Leaflets either long, linear lanceolate abruptly thrust pointed, or broader with equal shorter, ovate lanceolate or broadly oval, more or less pointed, all deeply cordiform at base lobes at base. Medial nerve thin, scarcely more marked than the veins either ascending nearly to the point with veins anastomosing from it in the narrow leaflets, or merely short and basilar in the broad ones, the veins emerging from around the point of attach of the leaflets. Veins thin not inflated forward the base, distinct, nothing four times, all parallel and preserving the same distance in their whole length, moderately arched from the base to the borders, abruptly curved upwards at the margins. Surface of the leaves evidently and narrowly crenulate or minutely divided both ways.

It is a well characterized species, only distantly related to the following. The frond is unknown no remains of stem or rachis has been found in connection with it, though at the only locality where it has been obtained, the leaves are in abundance. All these leaves or leaflet are marked at the base with a round point of attach 1/8 of an inch broad opposed downward by the two round auricles of the base which are equal in all specimens, or never more elongated on one side than on the other. This would seem to indicate that each leaflet was born upon a separate petiolet. The consistance or texture of the leaves is thinner than that of the following species. This with the thinner more distinct veins, narrow medial nerve, all of the same thickness, not inflated and parallel. distinguish at first sight this species from the others of the same section. The size of the leaflets is not very variable. The largest specimens ever seen is the one figured in the Geol. Rep: of Penn: loc: cit.: the smallest obtained as yet is 3 inches long and one inch broad. The breadth of the leaves varies between 1 and 2 inches. Nowhere

Found only in the Shale of South Salem N. at Fort Parbon, in a most abandonned shaft just north and even with the village and opposite on the other side of the river in the same vein from a shaft which was still worked 1868. (27. 6. 71.) See spec. 449 a Cyclopteris of a peculiar form which apparently from the nervation at least belongs to this species. If so it had a frond the number of the veinlets at the borders vary from 24 to 26 per inch according to the size of the leaflets. In the smallest which I have the number is 29 In cyclopteris above mentioned was only 40 per inch. Is more than the leaves. Base of the Cyclopteris is cut horizontally and the veins are parallel without branches.

Neuropteris hirsuta Lesq. In counting the veinlets along the margins in the space of one inch. I find that most probably we have two species. The one upon the Shale of Penn: is generally narrow lanceolate pointed or obtusely pointed with the surface marked by scattered, rare, very thin hairs. The veinlets are divided therefore veinlets more numerous more branching at or near the borders and the space between them more inflated. The veinlets are thus far more obscure than in the following in counting them along the border. I find ten in specimens very distinct as follow.

Sp: from Morgan Shale N. 139 has per inch 98 to 100 veinlets. – N. 42 Penn: 3: long above and base part 96 - 100
sp. N. 10 Penn: 3 inches leaf. 104. on the same spec. a narrow long leaflet 3" 98 no distance
N. 56 veinlets very distinct flat. 100. vid U. S. fil. pl. 1. f. 1. 104.
Ly. 33. large leaf. Penn: 95 to 104 viz 95 at a distance from the border. 104 at the borders
From this as from a number of specimens measured, the number of veins for this species varies from 96 to 104 the average being 100 per inch or 40 per centimeter.

The other species is as yet only represented by the nodules of Mazon Creek. The leaves are proportionally broader and more obtuse rarely lanceolate but rather oblong or with both sides parallel. The veinlets are more distinct and more distant marked at the base of the depression by a thread like filament. On the counterpart they are half round straightly elevated with the space between them scarcely inflated. The hairs are stronger, thicker more numerous, the petiolet of the leaflets is thicker and broader and more persistant. In counting the veinlets generally more distinct at the borders than in the former species. I find N. 178 base of leaf 60 per inch 76 veinlets per inch
N. 126 lower and upper part both 76 N. 124 leaf 3. 1/4 inch long 74
N. 152 the largest spec: 5 inches long 70 N. 158 " " 74
N. 174 4 " base 72 & 68 N. 112 " " 74
N. 135 2 1/2 65. – The average being 69 to 71. per inch. + number
of the measurements show the same difference – see over many such 68 specimens were

average 70 per inch = 28 per cent sometimes 30.

It could be supposed perhaps that the swelling between the veinlets along the borders in specimens upon shale may cause the difference. But it is not so. For in some specimens on shale as for example in N. 15, the veinlets are perfectly distinct and seen in their whole length. And at first sight it is easy to see a great difference in the distance of the veinlets on good specimens of these species. ~~(From may be too near of Brongniart the one representing his Neuropteris cordata to the other Neuropteris acutifolia: Compare Brongniart.~~ — If all the shale without exception represent as yet Neuropteris hirsuta, the nodules of Mazon creek have only the other species which would be named N. obtusifolia. With very few exceptions at least. For in specimens in the museum which are marked G. M. Perkins, I find one N. 258 with lanceolate pointed nearly smooth leaves or with scarcely any hairs, close veinlets counting 86 to 90 per inches and which is evidently referable to N. hirsuta. This distribution may be considered as peculiar and perhaps indicating identity of both species differently characterized from different circumstance of mineralisation. But I do not think that it is the case. For in the shale of Morris there has been not yet found only one specimen of Neuropteris to my knowledge at least and this is of hirsuta whole at Mazon creek the other species is the most predominant of all the species found there. But this can not be considered as a reason of identity of both species. The distribution of species in the coal formation is essentially local as can be proved by the enumeration of many species of Neuropteris &c.

† Neuropteris anomala P. B. nova. Primarily Lanceolately divided. Penna large, linear lanceolate, with a broad flat rachis whose ~~lateral~~ upper surface or epiderme show it as ~~is~~ compounded of fasciculate pinnules nearly disjointed, more or less parallel. The external one of each side entering into the leaflets as a broad medial nerve and there dividing into veins ascending to the point. Leaflets opposite, ~~or~~ subopposite, cordate, lanceolate ~~pointed~~ obtusely pointed enlarged to the base which is rounded on both sides with the lower lobe slightly longer. Medial nerve broad, often divided in two at its base, flat, separating in ascending and three or four times dichotomous and arching more or less in the ultimate divisions to the borders. — We have of this species a large specimen apparently a whole penna one foot long and a small specimen representing only the terminal pinnules of the same form as the lateral ones only slightly smaller. The lateral leaflets are about 2 inches long, one inch broad at base, scarcely diminishing in size toward the point, somewhat distant from each other attached to the rachis by about one line of the leaflets and sessile and opposite, nearly perpendicular to the rachis or slightly bended upwards near the point. The terminal pinnule is ~~is~~ lanceolate and rounded at base. The pellicle covering the flat rachis, like the epiderme of the leaflet is thin, transparent, and through it the fascicle of veins irregularly parallel in their course, joining into a broad medial nerve and from it, arching to the borders by three dichotomous divisions or separate segments of fascicles. This division is more or less irregular or incomplete. Some thread like filaments are here and there detached from the bundle of veins and veinlets and traverse in various directions the regular reticulation of the veins & veinlets. The appearance of this species and this mode of reticulation is peculiar. Nothing can be compared to it but the reticulation of Odontopteris Schlotheimi. Indeed we have from Morris specimens of this last species which by the reddish color of the epiderme and by the divarication of the threadlike filaments of the veins seems to indicate this species as a form of Odontopteris Schlotheimi. The reflexible and delicate texture of the rachis and leaflets as if floating upon a transparent ~~is~~ pellicle that we have in this Neuropteroid form the lower part of a partly immersed frond whose aerial part is the common form of Odontopteris Schlotheimi. In any case this species should be carefully figured for publication. 25.7.71 See Specimen N. 231

‡ This name anomala has been sent to Prof. Bigsby. — In Aug. 76 I found another specimen of this species at Shaft Mountain below Fremont. It is upon black shale and the pellucid epiderme is not seen except the filamentary division of the veins which may be a result of maceration. The veins are distant as in my figure, the leaflet as subopposite just as in my figure, longer than broad lanceolate to oblong, ~~pointed~~ but not pointed. All the characters broad rachis &c. are the same as in my figure. The substance appears to have been thin. See Specimen (No 1560. Sup. 381 (42) In No 1560 the leaflets are still more distant than in my figure

1 Genus Neuropteris As far as represented by Neuropteris hirsuta &c. the genus is remarkably illustrated by the form of the leaves, the nervation and perhaps the fructification by Gymnogramma tomentosa, Dev. of which I have a specimen in my herbarium (G. 213). The form of the leaflet is that of Neuropteris hirsuta. The terminal leaflet is simple lobed in the middle, with the upper pinnule adherent to it base; the upper leaflets are entire then in descending undulate, then round lobed toward the base which is cordiform, then with two round leaflets at their base. The surface is as in N. hirsuta marked with short scattered appressed hairs, and the veins which were too and the borders in nothing as in the same Neuropteris near or the lower side the sori along them all over. The surface thus representing exactly the inflated appearance of the veins as seen in some species of Neuropteris, and which Bronguiart supposed to represent fructification. There is the marked difference however; that the leaflet or pinna become too petiolate in descending being sessile only at the base of the upper or terminal pinnule See on the subject Bronguiart. Grand eury mem.

(2) Neuropteris anomala, Lx. Describe another specimen of Neuropteris crenulata from the same locality, Sharp mountain below Fremont Sep. 1565. represent this species still under a different form. It is a pinna, 12 cent long, narrowly lanceolate in outline. Terminal pinnule 5 cent long narrowly ovate-oblong narrowed into an slightly obtuse acumen and narrowed also in the same degree to the main rachis, with border undulate, lateral leaflets turned upwards and covering the rachis by their base, linear-lanceolate obtusely pointed, narrow, a little more than one cent broad, long comparatively long, the upper ones three cent the lower one about five, all undulate upon the borders, even undulate lobed toward the top, as seen from a detached leaflet at the base of the pinna. In this specimen the veins are distinctly seen, forking once or twice generally formed of two thin parallel filament which however in some part of the leaflet diverge and divide forming a kind of anomal nervation like that marked fig. 1a. This species appears somewhat related to Neuropteris Agassizii. In specimen 1560 the leaflet are very open, nearly in right angle to the broad flat regularly linear rachis 2 cent broad at the base which is slightly enlarged on auricle on the lower side, seventeen millimeters broad at the point where they are broken six centimeters from the base. They are thus nearly linear or very gradually narrowed upwards. The borders slightly irregularly undulate-crenulate, the crenulations scarcely distinct the midrib thick and enlarged at the base and in some leaflets thickened next to above the middle which in other it is (the midrib) not visible at all being flattened and its place marked by a few parallel veins.

3 Neuropteris auriculata. Brg. A small specimen No 343 is exactly the species as figured in German N. IV. the upper part of a pinna with very thin veins, pinnules

381.6

Neuropteris fasciculata. The creasing of the leaflets along the medial nerve appear to be a permanent and valuable character of this species. Specimen N. 207 208 as N 127 are referable to it. His evidently the species which I have named N. lisa in the Penn. report. At least as far as one can see it is comparable to it by the splitting of the leaflets along the medial nerve. But it differs much by the more closely approached thin veinlets. N. 197 though obscure is also probably referable to this species as also N. 203. N. 237 though indistinct. N 377. 11. 5 & fl. 91. fig 10 might be also referable to this. But the veins are not as distant and the leaflets are obtuse. (28.6.71) In leaves of medium size the veins count 60 to 64 at the borders with N. obtusa specimen. Nav. ined. The veins and veinlet are very thin not inflated, the epidermis also most thinne generally equally adherent to both sides. Specimens of N. obtusa with hairy rachis have veins and veinlets as those of this species, but in N. obtusa specimen. The medial nerve is marked by a broad flat ribbon as far as ascending to the middle or the 2/3 of the leaflets while in this species the medial nerve is a thin split in the middle of a broad depression and ascends to the point. The absence of hairs is also a marked character 22.7.71 referable to the species N. 381. 382. 383. 384. 385? this last Cyclopteris obliqua.

For division of the upper or terminal pinna and rachis, compare Pteris stenophylla of what I have specimen in my herbarium.

2 Cyclopteris (Neuropteris) trichomanoides Bgt. (Ma. 24.) Leaflet nearly round in outline, equilateral and emarginal cordate at the base (base deshonored). Veins flabellate very thin and close, sharp, nearly straight and scarcely curving in passing to the borders where they become so thin and close that they are obsolete or scarcely visible. No species agree with this except the one described by Brongniart under the name. His nearly 7 mill. wid both ways. In Brongniart the veins are not fasciculate toward the base as in other species of Cyclopteris. It seem referable to an Odontopteris. Its substance and opaque surface being like that of O. squamosa when deprived of its epidermis. Pg 2

2a Cyclopteris? obliqua? Leaves large oval obtuse 6 cent long 4½ to 6 cent broad, unequal at base, prolonged on one side into an obtuse auricle as in C. obliqua, Bgt. the auricle however descending less, and both sides rounding the rest round point of attachment of the leaflet, veins very thin but distinct and somewhat distant inflated and fasciculate toward the base, curving to the border without the leaf (the cloth) and surface polished. Apparently referable to Neuropteris trunculata cordata very probably Cyclopteris obliqua Bgt.

4 Neuropteris fasciculata. N. 1628 & 1628 b counterpart. These large specimens of leaflet with distinct veinlet very close near the borders, a very thin membrane might I thunk to be referable to N. fasciculata. Comparing them I find the same characters of nervation as marked above and a small leaflet N. 1629 show the very unequal base prolonged downward on one side in a broad auricle like that of 1628. N. 1630 seems also this same.

2a. Cyclopteris trichomanoides? Bgt. Mansfield has many specimen referable to the species described above under this name. I have figured. Ma 227. The largest leaflet 8 cent broad 6 long or from base to top. The veins at the borders are 140 to 56 per centimeter; no species except perhaps N. undans has so close veins. Another leaf 7½ cent long 6 cent. broad deeply cordate at the base, seemingly attached to the top of a slender short rachis has the upper border undulate and somewhat split as in Brongniart figure and also as in the specimen of Penn. Report 2 vol IV fig 19. But the veins are less fasciculate at the base. The characters agree with those of most species. In the last specimen the veins are very distinct

and their species.

1 Palæopteris Schimper. Syn: Cyclopteris Göpp. Adiantites Brgt. Noeggerathia Zenker.
Frons bipinnata, ambitu late ovato-lanceolata. Pinnulæ obovatæ et obovato-oblongæ, inæquilateræ, basin versus sensim in pedicellum brevem subdecurrentem angustatæ, singulæ in rachi primaria pinnis interpositæ, integerrimæ vel (ætate?) margine plus minus laceræ. Nervi complures, e rachi egredientes, repetito dichotomi, subæquales, ramulis pertenuibus numerosis. Pinnulæ fertiles in mediis pinnis dispositæ, valide divisæ, sororem fasciculos numerosos pedicellatos in nervo primario excurrente gerentes, soridiiformes (rivales?) [illegible] p. 476 Le genre Noeggerathia tel qu'il est caractérisé par Schimper Traité Vegt vol 2 p. 129 est fort different de Palæopteris. Lauterb. rapporte aussi, comme M. pour le genus Cordaites Ung. Schimper place à la fin de la 1re cohorte ou famille Cycadinées sous le nom de Cycnopteridium Brgt. avec synonimes: Diplotmema Hemt. Noeggerathia nonnulli, Cordaites Ung. (Pour la description de ce genre voir vol 2 p. 129 Schimper remarks that the place of this vegetable has not as yet been fixed.

1 Palæopteris hybernica (E. Forbes) Schimper veg. foss. p. 476 refers to this species Noeggerathia obtusa of the Geol. Report. p. 854 Pl. I. f. 5; 10 & 11. Not in the case as it is right. Noeggerathia minor loc. cit. I would be referred to the same, the specimen which were both pieces upon each surface, having had a pinna with leaflets intermediate in size to both. The description in the Geol. report is poor but may be modified by Schimper. The species are badly known and should be worked for carefully 26.7.71. B.16 is a number of specimens with long tenuis tinct appear to represent the same species. It may be an immature state of pinnule sections at the top. I cannot consider our American species as identical with Schimper species. It differs in many points especially in the rounded enlarged top of the leaflet as especially marked in the specimen figured by D. Dawson in his manual of Paleozoic Objects pa p. 454°.

2 Dactylopteris Schimper Pal. veg: 1. p. 465. See for description of the genus and of the species Dactylopteris Morrisii Schimper loc. citato. Here author places it after Odontopteris. My specimens are placed in the last drawer of the Neuropteris, p. 69.

3 Goniopteris Schp. Pal. veg. 1. p. 541. After his description the author remarks on the absence of fructification and on the impossibility of establishing characters from the fructification &c. saying Cet ensemble ne permet aucune conclusion. I have well preserved fructifications of Goniopteris emarginata. The sporanges are open without apparent indusium formed of [illegible] capsules of seeds placed star like around a central circular [illegible] little elevated and the capsules round oval form a conical sorus in six segments. The form of the seed capsules should be studied with the microscope. These sporanges are placed in regular order on both sides of the medial nerve forming two parallel rows of sporanges each or more which fill the whole space between the border and the medial nerve. The sporanges are each placed upon the division of the nerve or one of the veins!! and not between. [illegible] Schimper says in describing the division of Goniopteris desmophlebis: Sori nervulorum medio insidentes rotundi. An echantillon fructifere show the same form and disposition of sori both in G. conjuncta & G. emarginata. 6.10.71.

four and an half cent.

3 Cent.

Adiantides. Schp. Adiantites Auct. Frond simplex, pinnata, bi-tripinnata. Pinnulæ basin versus sensim angustatæ, oborato-cuneatæ vel flabelliformes, integræ vel subdivisæ, pro more tenues; nervis numerosis, e basi divergentibus dichotomis. Schp. Veget. Pal. I p 424

1 Adiantides nervosus (Brgt.) Schp. Frondo bipinnata pinnulis oborate cuneatis, subintegris vel vix bi-trilobis, obtusissimis, nervulis flabellatim dichotomis, numerosis, approximatis, distinctissimis. Veg. Jour. p 124 tab. 56 fig 2.

To this species, I refer without doubt the small specimen 041. Fine burnt branch of Caney coal 1 B of Ky top. I agree in toto with Brongniart figure and description even the form of the rachis &c. Mine specimen shows only two leaflets one of which is divided at the top in two lobes by emargination. 26. 7. 71.

2 Adiantides rhomboidalis sp. nov. Frond bipinnate secondary pinnæ short, tri-quinquelobate, distant, attached to the main rachis by a long smooth narrowly winged pedicel, rachis zigzag in the middle, smooth. Pinnules alternate distant, obliquely attached to the rachis by a short broad pedicel, varying in form from oborate or rhomboidally cuneate; terminal leaflet larger, oborate very obtuse sometimes cleft or emarginate at the top, sometimes merely undulate narrow at into the top of the secondary rachis. Veins flabelliform from the base, dichotomous thin, numerous and distinct. Schimper does not mention the species but I figured and described it in the Govt. Rep.t of Penn. under the name of Neuropteris Backhousiana Gopp.t. I think therefore that it is a distinct species and should be referred to this genus Adiantites though we have two leaflets apparently terminal. 318.c & 319 which have a deltoid form, being elongated upward to an obtuse point and tapering downward from the enlarged middle part of form and nervation are referable to species of the genus Palaeopteris. Good drawings should be made of this species. Specimens 318 & 319 this last has longer narrower leaflets merely oblong or oblanceolate and in having slightly oblique small terminal pinnule should be referred to this species. 26. 7. 71.

3 (Neuropteris Hartii Lesq.) Appropriate pl. 29 fig 1 — to splendid specimen of Mazon Creek 5.001. Collected from coal [illegible] except that the leaflets are [illegible] and united. [illegible] compare these specimens in the [illegible] (Doubtful.

This is much like Sphenopteris mysta. May be the same. But Goppert's species has no trace of nervation. Schimper does not describe it.

352 from 350

not Gymnopteris

hemidelon do.?

4

Of this specimen

8

8

A very fine pinna from ~~Mexico~~ Mexico as drawn (Moore's 257) represents the two forms figured in the Gen. Rep. of H with leaflets contiguous or separated and in this case united by the base of the leaflet decurrent and forming a border or margo along the rachis. In this specimen the secondary pinnæ nearly perpendicular to the main rachis (marked with points or dotted) & turned upwards are likewise and long & parallel to the leaflets which are sterile but of the same width. Borders slightly serrulate. I refer to the same

Species two specimens F 260. representing the pennil of a bipinnal frond or part of frond. Triangular in outline taper pointed; primary divisions slightly turned upwards on a comparatively broad pendulat rachis; lobes or leaflets oblique, oblong enlarged at base and united, decurrent & blunt pointed with nervation same as in F. 259. When the leaflets are disconnected at base, they unit by a decurrent border. 14.11.71.) See below (?)

2. Alethopteris Crenulata. I have reviewed this species and compared it with all the species given of Callipteris conferta to which Schimper refer it. Callipteris conferta has always the basila veins more or less distinctly attached to the rachis, not to the midrib. In our specis where however may not be the case. Moreover all the veins over the lower pair are always branching from the midrib. This species has nothing of a Callipteris but is rightly a Pecopteris or an Alethopteris. The veins are more generally forked from near the base sometimes one of the branches is also forking near the border. But I have remarked this only upon a specimen with broad short leaflets N 142 of the Agassiz Museum and this forking double is only at one place or for a pair of veins and near the point of the leaflets. It is certainly a good species. However the specimen remarked upon p. 352 (3) as P. crenulata N° 259 appears to be a mere form of P. crenulata. It is a pennul of a pinna on each of which only is seen. Ultimate pinna somewhat flaccuous long, nine centimeters, leaflets short, oblong oblique jointed at the somewhat decurrent base with the terminal pinnul short oblong. Seem to be P. crenulata. But the rachis is very thick. Crenulata. F. 260 is a fruiting part perhaps referable to the same species.

3 Gonopteris sp. nov. fig 2 Pl. LVIII (provis) fig 1.1c. a small branch or bipinna pinna with short oblong leaflets turned upwards divided to near the slightly decurrent base with thin midrib and veins either simple or forking from above the middle and turned upwards. May be described by author? Specimen 49 of Gibson's (unito?) Spring Creek. Ills (in Lowe Catalogue)

572 Dendl.

small

Under

L 1 Goniopteris [illegible] ~~subarte~~ (may change name) Lacer spec. 685a L68 Here one
fragment of a pinna, lanceolate to the point. Th of the fragment marking the base
of a pinnule linear, pinnules open, nearly at right angles to the rachis, ~~xx~~ thick coriaceous,
8 to 13 millim. long 5 to 6 millim. broad, oblong obtuse some of them narrowed
to the base and oval sometimes petiolate connected along the costa or the borders to near the top, all united at the base some of
them distinct all along midrib thick or broad flat, ascending to the
lateral veins 11 to 14. thick, in acute angle to the midrib, curved (wings
not straight, parallel, mostly simple, in the largest leaflet, one the
lowest ~~pair~~ pair once forked ~~four times in the middle of the~~ near the base. The appearance of
this species is far different from that of the two other species and rather
recall the species of Callipteris of Europe. only the veins instead of
being curved outside, are distinctly curved inside in the large leaflets,
and nearly straight but at acute angle in the small ones. This
fine species with thick coriaceous leaflet is from the subcarboniferous
of Pittsburg (not frequent). The veins from the thick midrib arise
12 to 15 pairs, those of the upper half of the leaflet very distinctly curved
inward, those of the other or lower half more straight. The figures are
good representatives of the two specimens seen.

Remarks on Calamites.

Our specimens in Museum except Calamites gracilis Dgy in My report (vol 4 p. 436, Pl 3, fig 5 ined) do not show any difference from the European species & have admitted Schimper's species as marked in his Pal. veg. pages 312 & 319

1. Calamites Suckowii Brgt, the most common of all in our Coal measures. The bark is thin, very narrowly striate, as also the under surface; at least sometimes so. The cortex are broad and flat, the articulations sometimes quite near each other. We have of this species among numerous others one splendid specimen which comes from Mazon creek. It is flattened to about two inches, is 9 inches wide & inches long with articulations scarcely 2 inches (two) distant, cortex 3/4 mill. wide with large broad oval scars of leaves. The coal surface is a little thicker than in the generality of the specimens but not as thick as in another specimen of ours (42. which has its surface coal bark about 1 mill. thick. For this reason I think that this specimen which is evidently the representative of C. nodosus Post. (through Schimper) Foss. pl. 23 fig. 3. can not be referable to C. Suckowii and that C. nodosus Brgt is a good species. The space or ravine between the cortex is concave and as broad as the cortex on which in C. Suckowii the ravines are very narrow. The coaly surface is like the under surface narrowly striated and the articulations are variable in distance as in Pl. 15 fig 1. of Brongniart (see Grand'Eury p. 14).

2. Calamites Cisti Brgt. difficult to separate from the following species. Perhaps in my specimens none of which is too good some may be referable to C. dubius Brgt. Generally the striæ are narrower more equal and there is no trace of scars of branches (see Grand'Eury p. 19.)

3. Calamites dubius Artis. The finest specimen of our Calamites represents this species (42. pl. 1) is 3 feet long, scarcely one inch in diameter at its base, 3 inches at the upper part where it is broken nearly cylindrical or scarcely flattened gradually tapering upward from the base where the articulation are the 4th of inches then the 3 following each 1/4 inch wide Pl. 5 11 less than 1/4 an inche and above this about two inches distance till to the upper one where they abruptly narrow to 1 inch and the last where the specimen is broken to 1/2 an inch. The articulation are therefore most variable in distance and in this specimen at least the stem is not a curved rhizome but true erect stem without trace of roots whose base is not 1/3 in diameter as it is three feet above. The surface coaly matter is thick varying from 4 to 5 mill and is narrowly striated & the internal or under part or the surface of the internal mould as Schimper will have it. I have not in the Museum the specimen on which I made Calamites Sedgwickii of the Geol Rep! of Penn! p. 850 Pl 2 Fig 1. It is probably belongs to this species or to C. Suckowii (my how the species can not be preserved, no more than C. dissimilis Dgy loc cit Pl. 2 fig 5. See for C. dubius description in Schp. Veg Pal. p. 313.

4. C. approximatus Schl. We have only three specimens of this species which are in our American Coal measures. At least I have scarcely seen any in the collections which I have examined.

5. Calamites Cannæformis Brgt. including C. decoratus Brgt is represented by numerous good specimens. Schimper does not mention either as synonym or as species C. paucidentatus Brgt. We have one fine specimen 9 inches wide at base, 5 inches wide at the upper articulation, 4 inches distant, coal bark as thick as mill which agrees exactly neither to figure & description of these species by Brongniart. (see fl. p. 132 Pl XXII. It is to be remarked that our specimen indicate the normal forms or inflated articulations as in his C. nodosus which Schimper unites to C. Suckowii (and whilst for some of its representatives like this one would be united to C. Cannæformis see p. 312 (3)

6. Calamites gracilis Dgy. as described in the 3rd vol of My report I regard as a good species. Though no trace of sheath can be observed at the articulations, these are marked as in calamites by very small points or scars indicating attach of leaves. The stem is very narrowly and equally striate as in some stems of grass. The articulations do not vary much in their distance which is about 1 inch. Stem exactly lines 5 mill wide 14 inches long. (31. 5/72).

Newberry.

Le musée possède dans les nodules de Mazon creek un nombre d'échantillons contenant seulement la disposition des pores et l'écorce. Hyde cite Lawrence Berry représente la partie centrale perforée comme Lindley & Hutton Vol VII. Le diaphragme persistent mince a peu près un demi millimètre d'épaisseur de consistance spongieuse, apparaissant comme percé de pores ou petits trous comme s'il était garni d'une substance cellulaire. Les parois ne sont très bien visibles que sur l'échantillon C. 43 qui est brisé en trois pièces. Sur tous les autres spécimens on voit distinctement que la tige était creuse. La base des tiges qui aboutit au diaphragme est parfaitement bien préservée sur un spécimen C. 72. Une partie de la tige a été brisée, écrasée sur le diaphragme qui est distinctement vu à travers la mince substance de la tige. Un autre spécimen C. 59 est encore plus instructif. Par compression la tige a été pour ainsi dire disarticulée. Le diaphragme résistant à la pression est resté à peu près horizontal avec les bords et les branches de la tige attachés à l'un ou l'autre côté. Le bord supérieur par contre a été aplati et comprimé à la partie interne du diaphragme et ainsi toute la circonférence de la tige est apparemment marquée de cette manière. Le diaphragme en a est vu de face avec son apparence spongieuse remarquée ci-dessus.

1. Calamites & Calamodendrées, see Brgt. mem. in Grand Eury p. 7 on the difference and character of their vegetable remains.

2. Calamites undulatus Brgt. Ac Schimper remarks, this form is a mere var. of C. suckowii. I have numerous specimens from Aldrich Montevallo mines Al 17-21 which are undulate on one side and straight on the other. This however do not explain the cause of the undulations, for if it is as Schimper says by a mere vertical compression, both sides of the flattened cylinder should be equally undulate. - In this case the epidermis is preserved by a shining coating of coal showing the cortex to be obtuse and very thinly striate. The specimens bear traces of branches and are distantly articulated. In Vol III. p. 455 Schimper considers the C. undulatus from Arkansas as type of Bornia radiata et d'après la figure la description qu'il en donne il faudrait rapporter tous les échantillons ci-dessus qui se rencontrent en si grande abondance dans l'Alabama les échantillons se distinguent par l'absence de tubercules aux articulations, le grand variété de côtes qui sont très minces et généralement couvertes d'une mince couche d'un poli de charbon. Many specimens are undulate as in the Arkansas figure of C. undulatus. Some have the cortex less than one millimeter broad while others have them as broad as those of C. Grayi Brgt, a small specimen from Helena coal mines shows them 6 millimeters wide and undulate across under the pellicle of coal as the specimen from Arkansas. This can not be considered as a character for on some specimens from the Woodworth mines the cortex on one side of the specimens are broad as the other and are closely lineated but distinctly lineated in the length while the other flexures are wrinkled crosswise as in the Arkansas specimens. They have generally a tendency to undulating but only on one side. This species differs from C. suckowii by its distant articulations and absence of tubercles. It however bears traces of branches at the articulations, small however as that of Calamites cruciatus Brgt.

see for Calamites p. 371 for Calamodendron p. 370 for Calamostachys

Antholithes Pitcairnia Ld & Hutt. The museum has numerous specimen of this species especially two nodules Di 94 & Di 95. representing a narrowly striated stem 3 mill in wide, bearing on the axil of a long linear leaf like bracte with a prominent medial nerve alternate or opposite oval fructifications apparently formed of a number of foliules folding upon each others and containing seeds. They seems at least indicated by irregular interval which are seen in the internal part of the horizontally broken ovules. I think that by cutting and polishing these ovules can be studied and their internal composition recognised with the microscope. I can not compare Lindley with these specimens but they appear to represent the same species. Di 76. & other specimen from Gomroy show the ovule as surrounded by pointed scales the point depassing the ovule. A very fine specimen Di 98 of apparently the same species and upon a nodule from Mays a creek show two kinds of ears just like what I have named in this vol. Schutzia bracteata. P. 427 Pl. 21 fig 6 to 9. The kind bear longer pedicel with apparently a single ovule lanceolate obtuse ovule sustained upon a long bract. the other bears short pedicelled oval cones with imbricated ovate truncat scales. It is the same species as the one represented by the other specimens and the Schutzia of this vol is probably referable to it. I find nothing in Schimper on relative to this. He puts Geinitz Schutzia vol 2 p. 355 in the Genera incertæ affinitatis of the Conifers. and quotes as synonime Antholites Zamites of Hachyopitys. see Pal. regt. p. 360)

From the observations of Grand Eury and of Goldenberg (see Schp. reg. Pal. p. 562) the Antholithes are the flowers of Cordaites. See also Bourgeaut Grand Eury p. 14 215. (1)

2. Antholithes Pitcairnia Ld & Hutt. is represented perfectly identical in three branches specimen of Lacue N. 251. 252, 253. They exactly agree with Ld. & Hut figure

Sphenopteris.

1 Sphenopteris spicæformis. Germ. & K. 33 fig. 1. We have three specimens Nº 2. which represent this species but though the specimens are better than those figured by German, they do not positively show if the divisions of the branches are opening pinnæ of ferns or filaments as figured by German. The secondary pinnæ in one specimen have still a broader base and rather seem referable to some fucoidal fern.

Dycrophyllum Brgt. Cordaites,

Flabellaria Stern. Noeggerathia nonnul. Cordaites Ung.

1 Dycrophyllum angustifolium sp. nov. Foliis spiraliter trifariam dispositis, e basi dilatata linearibus, tenuim angustatis, inflatis, subcylindraceis, angustis elongatis acutis, integerrimis, nervis continuis, distinctis parallelis, simplicibus.

This species is far different from any other described by its narrow leaves, not broader than 6 mill. often narrower, attached like Cordaites in a spiral position around a narrow stem ½ cent. wide slightly enlarged at the point of attachement either exactly linear or gradually tapering to a point. The parallel veins are comparatively thick, distinctly marked, nearly as distinct as in Cordaites borassifolia but not quite so distant more 4 to 5 in one millim. nearly equal, varying in thickness. It is a true Cordaites, with the epidermis undistinctly marked by striate parallel piped cells as Schimper describes it which by the mode of attachement of the leaves especially much differs from Noeggerathia palmaeformis Gopp. The museum has many specimens from Cottsville and other places. The texture of the leaves is hard but the leaves as seen in type: Di 6 appear to have been subcylindrical their print in the shale being always concave and their transverse breadth looking like a flattened cylinder, some leaves of this species less than three millim. wide with same nervation & consistance appear like glumaceous leaves and this appearence is the more striking that some of them are horizontally marked as by the articulations of the leaves. This appearence is due perhaps to irregularity of the stone and may not be of a true organism. The specimen Di 6 has not stem, the leaves appearing as forming a bundle of top leaves and diverging from a centre up in all direction. Di 96 from Morris has the stem and leaves as described here: its leaves are more flattened than in the Cottsville specimen, but the characters are alike. Di 6 b. shows the appearence of articulations like sheaths while Di 6 c shows the enlarged base of a leaf at its point of attachement.

2 Dycrophyllum angustifolium Lesq. Fl. 5: is a remarkable variety of this species distinguished from the typical two forms of this species. It represents a leaf of the same consistance, same nervation as the forme linear, longitudinally split in lacinia 4 to 5 millim. wide, parallel, the splitting being irregular or at some place, the lacinia uniting again upward or downward and being wider or narrower sometimes like a mere thread. Near the base one of the lacinia separates from the leaf in compound of leaves in a short linear, obtuse lobe. This is a kind of division which appears abnormal or merely casual. This is an as yet unexplainable form of probably this species which after all may belong to some other kind of vegetable as Dycrophyllum Di 4 a shows the species also with that peculiar division by splitting. It represents a narrow leaf, not 3 mill wide enlarging upward as if unfolding a cylindrical leaf and separating by split and as by crushing in four or five lacinia one of which is as large as the whole leaf at its base. This undue division as also the appearence of the articulations is seen also upon Noeggerathia palmaeformis Gopp as figured by Geinitz, Pl. 22, fig. 7

3 Noeggerathia palmaeformis? Gopp. I refer with some doubts to this species as figured in Geinitz loc: cit. Specimens Di 92 from Mays creek & Di 47 b from Cottsville. The nerves are more obscure, covered by a thicker pellicle more equal and equally distant. Geinitz says that the substance of the leaves was thin. It appears indeed thinner or at least not as hard and tenacious as in the former species. The leaves are broader fasciculate, enlarging in ascending. In comparing this species with the following species (Dycrophyllum angustifolium) I do not find it possible to separate the specimens according to the consistance of the leaves which are not all parallel.

Cordaites gracilis.

4 Noeggerathia ~~palmaeformis~~ ? ~~Ung.~~ ? Di 18 the specimen 3 & 4 which are of the same plant are referable to this species. The leaves are attached in spiral to a stem 1 centim. broad, narrowing at the point of attachment. one centimeter broader above the base enlarging upward to twenty two millim. and gradually decreasing upward to an obtuse point, perfectly entire, marked by distinct, parallel equally distant veins 1/2 a millim. distant with surface marked by parallel papillae areolation or reticulation. For the width of the leaves the distance of the veins equal and parallel, this form agrees well with Cordaites palmaeformis Gopp. But in our species the leaves are narrowed to a point at the moment and not linear as described by Goppert the species may therefore be considered as different.

5 Noeggerathia crassa Gopp. One specimen Di 32 from Maya creek agrees in toto with figure and description of Goeppert Uebergangsg. p. 220 pl. 40. I have sent to Brgt. the counterpart of this specimen. It shows a large stem somewhat cylindrical leaf gradually enlarging upward doubly striate, with strias irregular in size somewhat resembling a stem or calamites striae also vary in distance. The specimen bears also Gyromites annosus The leaf is 3 centim. wide at base and more than 7 cent at the upper part where it is broken. The preserved part is 20 cent long. Its base is depressed into the stem looking as if attached to a stem.

6 Cordaites Borassifolius Ung. Gein & Gpp. To this species, I refer large linear leaves obtusely pointed, split or entire at the point, 7 centim. broad apparently very long with parallel nerves, irregular in thickness, close to each other 5 to 6 or more in one millimeter and marked across by parallel papillae areolation. The species ~~xx~~ exactly agree with Schimper description but Schimper says nothing of the number of veins which is far greater than in N. 4. This species is easily known by the size of the leaves the closely approached and irregular veins. Specimen Di 9 seems to be a crushed leaf of the same species or rather of (see 8) ~~x~~ 364 (1).

7 ? Flabellaria principalis Germ. It has the same nervation as indicated by Gein by figures 2 & 2a Tab. 21. and like the same fig. 21 is enlarging upward and splitting in lacinia. The veins are generally of two kind, primary ones about 1 millim. distance separated by 3-4 intermediate thinner veins. They are however irregular and often become indistinctly mixed. the same difference is seen in the veins of Noeggerathia Crassa; but the primary veins are twice as distant.

4b. Two specimens Di 18 are apparently at least by the distant veins referable to this species. The leaves however appear narrower and linear and the primary nerves separated by narrow reinlets. The specimen are too obscure for determination

8 Flabellaria ? 2 a broad linear leaf somewhat thick, 8 centim wide with parallel distinct well marked veins irregular in thickness 2½ to 3 millim. 6 in two millim distance. Referable to Cordaites borassifolius; but the veins are more distinct and more deeply marked. The areolation, parallel papillae is marked

9 Cordaites with narrow leaves. See Cordaites Grand'Eury see Brongniart Campbell on this Pal. world. p. 13 (1).

10 Artisia or Sternbergia. See Brongniart on Grand'Eury p. 13 (2), Most of the species of Cordaites are referable to the genus Dyctyopteris, Myelum Phyl. The observations of Brongniart upon this genus are repeated still more clearly in Veg. Pal. vol III p. 560.

See p. 378a

1 Cordaites Borassifolius Sternb. Ma. Ger. two specimen from Mansfield represent this species as described by Corda. One of the specs. 90 has the base marked with ramular punctiform small scars as indicated a character of the genus in Schp. vez. Tal. p. 661. The parent of the leaf represented by another specimen is split and blue; the veins are generally as indicated by Corda primary one more marked separated from their, but in the same leaves and under the thin epidermis the vein, opposite all equal. The primary one, being formed of a fascicle of two veinlet which after crossing of the epidermis appear as separate veins and of the same size as the intermediate one. The distribution of these parallel veins present however a great deal of difference and variety in the same leaf. The very thin cross veinlets forming the square areolation are scarcely discernable. This specimen 90 present an interesting features. The leaf is marked with round dots or holes ½ to 1 millim in diameter appearing like sphæria. They are produced by small balls of clay iron for the appearance profusely on both sides of the leaves, upon the washed stone as interposed between the layers wherein the leaf is preserved. (See p. 420)

2 Cordaites N. 1 of f. 359 is apparently the species described and figured by Dawson Detor. plants p. 44 pl XIV, fig. 164 under the name of Cordaites spec.

3 Cordaite N. 407 p. 360 is from description the same as I have seen at Morris (Oct. 67.). The leaves are comparatively short, narrowed from a round a very obtuse somewhat inflated point to the base 1 cent broad, while at the point it is 12½ millim broad with longitudinal lines distant, obtuse and comparatively broad.

4 Cordaites gracilis. Sp. nov. Stem slender elongated, (the specimen I have viewed from Morris, 1867) showing a branch or stem, 17 centimeters long, eight millimeter broad a thick at the base and erect to top at the top. This stem or rachis is covered by a thick pellicle of coaly matter one millim thick about whose surface is regular punctate as also but less distinctly the subcortical surface. The leaves are close, alternate all around the stem distichous by compression the upper one three millim distant of the same size, or one and an half millimeter between them, sessile by a slightly narrowed short pedicelled base, either in right angle to the stem or turned backward from the point of attachment, narrow, four millimeter broad above the point of attachment which is only two and an half millimeters broad, decurring half the stem; enlarging very gradually towards the point where they are just one cent broad. They appear short. The preserved entire is 9 cent long only cut obliquely at the top and there slightly reflexed. They are generally covered of a coaly epidermis which however is easily separated. When present is very closely, narrowly but obscurely lined, the lines about equal; but under the epidermis the respiratory is more distinct and visible. The mediæ veins being distant nearly one millimeter separated by two or three very close veinlets, and regularly across the obliquely truncal leaves at the top may be considered a character of this form which, by the size of the leaves separated by veinlets seem to represent the fragment figured by Dawson Dev. plant p. 44 pl XIV fig. 165 which is merely named a form of Cordaites. The obliquely truncate point is slightly obtuse. Comparing this to Cordaites angustifolius of D. of the specimen with stem and leaves I find the stem and leaves narrower by one half the primary nervation less distinct in the upper part and in the lower part distinct, and in the decorticated the primary nerves less strongly marked, not as distinct with those intermediate veinlet which is that from (See correction 534) (See p. 478) there are two or three. The regulation across about the same

1. Bruchmannia tuberculata. H. Lee, Descr. Mem. Grand Cuy p. 18.
In the cabinet of J. L. Wurg. I have seen an ear of this species 5 p cent long and three and an half broad with an axis apparently narrow.

† 1 Lescuropteris Schp. The genus is well described by Schimper and its place, at least considering its nervation, between the Odontopteris and the Alethopteris. To this genus may be added probably Alethopteris Sullivantii, on account of the nervation at least and any how Lescuropteris Rardei described C.B. p. 41 N 155 which has a nervation in perfect concordance to that of Lescuropteris Moorii or half Alethopteris half Odontopteris. To the the essential character, in this nervation, the secondary veins, at the base of the pinnules going out of the rachis and curving to the border, the other from a narrow midrib, in an acut angle of divergence, curving toward the border and dichotomous, forking one or twice as in the neuropteris and joining the borders nearly at a right angle to them. To the genus may be added:

† 2. Lescuropteris Mansfieldi Sp. nov. Pinna lata; (the fragment appreciant of a pinna is 12 c/ cent long, 3 c/ cent broad from the middle to the base, linear-lanceolate, gradually narrowed to the point, pinnules directed in oblong, obtuse, open pinnules 1 c/ to 2 cent long 6 to 7 mill. broad toward the base where they are joined by a very acut sinus, the borders often imbricating or joined from the middle to the base, both shaped or curved outside middle near this, dissolving below the point top of the pinnules; secondary veins at an acut angle of divergence curving in passing to the borders, rarely simple mergenerally forking twice rarely more, reaching the borders at right angle to them, lower veins from the rachis which is narrow an channeled in the middle. This pinna has a remarkable analogy to L. Rardei but differs by its consistence which is thinner and not coriaceous by the thinner closer secondary veins. The difference is not great.

Lepidocarpus Geinitz. This genus should be preserved for those kinds of organism which I have described in the Penn.ª 2nd Geol Report. p. 876 under the name of Brachyphyllum. By two specimens recently discovered, (August 1876) in Pennsylvania they apparently represent peculiar fruits in long grapes, or cylindrical cones, apparently hard capsules or seed vessels containing spores. One species is described in this vol. p. 463 c (18) under the name of Carpolithes imbricatus and is figured in my plates. another is in the Geol. Rep. of Penn.ª loc. cit. as Brachyphyllum obtusum and one or two others are represented by specimens recently discovered. The character of this genus may be described as: linear, long fruit bearing rachis or receptacle, linear, flat or cylindrical, bearing sessile flattened or inflated and angular capsules, either imbricated all around and covering the axis or placed on both sides and distichous. The species may be named as follow.

1 Lepidocarpus imbricatus? or any other specific name, for the one described p. 463 c (18). See p. 366.

2. Lepidocarpus quadrangularis. sp. nov. Rachis narrow half a centimeter about. capsules sessiles, alternate distichous on both sides of the rachis, inflated, obtusely quadrangular or cubical, oblique by truncation at the outer end, nearly on right angle or slightly turned upwards along the rachis. This which is represented specimen N° 38 of M Lorenz of Chestnut Hill, Philadelphia may be a form of the branch which I have described in Penn.ª Rep.ª loc. cit. tab, thus being flattened and the capsules compressed or merely representing the fruiting axis with scars of the detached capsules. One branch of this kind with scars all around and compressed flattened capsules on one side, evidently the same species as that Brachyphyllum obtusum is seen of the reverse of the specimens representing Lepidocarpus quadrangularis. by cuboidal distichous capsules.

3. Lepidocarpus pectinatus sp. nov. Rachis flat, and broad 10 & 12 millimeters, obscurely and irregularly striate capsules oblong ovate by their whole bar, short, 7 millim. long. abruptly pointed cuspidate in the narrow convex middle, four to five millimeters broad showing by cross section a flattened rhomboidal form ◇ and contiguous on the borders. The fragment N° 1564 found at Salem r. of Sharp mountain near Tremont is very small but quite distinct. The capsules are evidently distichous and placed on the side of the Rachis, one of which only is preserved. These fragments should be carefully figured. Compare the Brachyphyllum mammillare Brgt as figured by Schimper Pal Vegt Pl LXXV figs 18 & 19. Repeat this N° 493 Lance. with longer less compressed capsules. It may be however a different species much different from the figure

1 Lepidocarpus imbricatus. Sp. Goldenberg pl XVI. fig. 9 has the base of a cone with some likeness to this. The axis is however broader in Goldenberg figure and the scars of the sporange round. F.

Spore cases. General agglomération of spores either agglutinated together without any apparent vesicular organism or united by filament or by a band of support in either vertical or horizontal rows. Spores of comparatively large size, discernible to the naked eyes.

1 Spore cases under the mic. N 296. 295, 297, 292. 291 299 of Lacoe specimen. Round or oval groups of sporangia apparently agglutinated together by the borders and therefore of various forms irregularly square or polygonal with a smooth and convex surface. No kind of envelop is perceptible around these cases. Spore measure when at rest eight millim in diameter. remarkable for

2 Spore cases. oxygonous. Spec mic. 307, 308, 309, 306, 314. Spores agglomerated in an oval group twice as large as that of the former species 12 to 14 millim long 7 to 8 millim. broad, placed lengthwise or in vertical rows, flattened with a marked point or very small nucleus in the middle, with the borders raised above the surface which is then concave. When empty like a frame of undulated strias vertical as in 307.

3. Spore cases ~~Sporocarpia~~ undulate ~~undulata~~ by mic. N 301. Lacoe specimen. Agglomeration of spores slightly broader and shorter than the former, nearly square. Spores in horizontal rows apparently in the bottom of a small scaly sporange. These scales being may be the sporanges after dispersion of the spores.

Sporangites, Sporocystes & Sporoplegma.

I believe that the agglomerations of spores (macrospores) evidently of Lycopodiaceae species must be generically described as sporangites when the cases sporophas are of a same form and evidently attached to a support or marked by a point of attachement to it. Sporocystes (σπορος and κυστις adv. vide angiogonen in mem. proceeds agglomerated generally inordinately without kind of support or covering I have after them, and sporoplegma as spores in bones or basket for those that I have described above.

4. ~~Sporangites pteris pinnatifida~~ (?) Ma 294 This is merely a bracket of Cryptogramma pinnatifida pinnate by a narrow flexuous rachis ~~inflated~~ in the middle. Some millimeters long, two millimeters broad, truncate at both ends, contiguous by their whole length. Recently a small pinnula of fern with the division in right angle to the rachis without trace of nerve, inflated and pinnately placed. Compare ~~other~~ this specimen.

5 Sporangites ? — It is necessary to study these bodies very carefully that agglomerations of small seeds, macrospores, attached to stems like the sporanges of ferns is ~~these~~ in the cool by both our specimens Ma 236, two specimens. One of them has these seeds widely spread and without any apparent order one the shale as this is represented. In the other these evidently appendiculate or attached to branches of a stem. This has to be carefully examined. They have the characters of macrospores, positively are very distinct. They are clearly visible to the eyes, half a 3/4 ths of a millimeters in the flattened, crowded and empty as in fig. 236. but still showing these original round triquetre forms. or when attached to the pedicel globular with ⊗ cortex in triquetre order just like the spores published by Hooker under the Cover of Lycopodendron M V & C. From this it is evident that these can not be called sporanges. They are free macrospores born at the ends of cones or possibly at the racemes. See also the specimen I have of another in glomerules. and so forth

(1) Sporocystes planus Ag = Spo. viridis p. 367 (1) under N. 239 Le we has
Lepr. specimen representing this species, but capsules before opening. The capsules are
broadly oval or the round convex of the surface where is irregularly pitted by
compression between the seeds (under of it whose place is decayed) neither
by the depression of the surface where is thin specimens. Some of the opened ones
are open the same specimen the capsules where the contain are invisible
Syz. Map. and positive resembles an agglomeration of very small inflated
capsules containing seeds? or spores? But o others these capsules are flat
and as figured bodies a central scar surrounding a spore

Bornia.

Dall 06

1. Bornia radiata, a good fine specimen from Kaut creek represents the species or at least a Bornia. as the genus is described by Schimper. The articulation are distant, the ribs comparatively large obtuse the furrows between, not deeply marked. The space from the surface of the central axis is two & an half centimeters. The central axis is ribbed like the surface, but its width is not seen as it is broken in the length parallely to its border. The widest part seen is 8 millim.

There is in the cabinet of Lucas 1/4 80 a subconglomerate representing a splendid branch 12 cent long, 5 mill broad, with articulations 2½ cent distant leaving 30–40 lineae distinct bares. less than one mill broad. 6½ cent. long straight very oblique sometimes curved inward but not much, there round a cylindrical axis exactly resembles the figure 2 of Bornia radiata given in Schimper Atlas pl XXIV, the bares appearing also limited or approached by two lobes at the base. I have no doubt that it answers to the same species.

Calamorhachys.

Calamorhachys tijuica. Schp. Ill. 328 Rdo Wohlmannia gracilis Hs H. p. 53. Pl. XV f. 1–3. Fertile branches flattened. half a centimeter broad distinctly regularly striate with flat slightly linear comparatively broad costæ. articulations a little more than one centimeter distant, not strangled or contracted nor inflated. leaves open somewhat adnate inwards narrow one millimeter, nearly flat or slightly convex with the surface opaque without trace of medial nerve three centimeters long not numerous 16–20 in each verticil gradually narrowed to a slightly obtuse point. Fruiting stem of the same character, articulations 2 p cent distant. with yielding in verticils spines born upon a short pedicel, scarcely two millimeters long cylindrical half a centimeter in diameter, seven centimeters long bearing on the axils of verticillate leaves oval sessile nutlets two millimeters long, nearly as broad, broadest toward the apex; space between the fruiting verticils 2 p millimeters. leaves (fruiting) open at base, curved upwards, for the base enveloping the nutlets half centimeter long linear lanceolate, gradually acuminate, nerved. The branch which is inflated at its base, point of attachment to the stem bear one dozen of more of these fruiting spines those of the base apparently distichous or on both sides of the branch. the intermediate one seen destroyed or attached to the counterpart of the slate. The scar of the point of attachment of the ears is desticicely seen upon the articulations were pouring with the costæ 3–4 upon the upper surface between the bases of the preserved ears

1. Calamites approximatus Schloth. A fine specimen in J. F. Mansfield collection Ma 51. represents a stem only 3 p cent broad with articulations 2 p cent distant towards the base, four cent in the upper part; inflated at the articulation which are slightly marked and covered with the striæ, marked upon the articulations by broadly oval or rather round, enlarged at the side O scars of branches or leaves placed in quincunce or in three ½ separated each by one articulation. The scar are 8 millim broad. and 6 mill high. This form exactly agree with Schimpe description Pal. Veg. 1. p 314 and also with that of Geinitz Kart. whose fig. pl XI fig 3 has the same characters as this fragment. This is Cal. cruciatus Brgt. Cat regularis Kent. who has also a good figure of the species. The specimen might be figured. But a note on the different characters may be sufficient. see p 374

Grand'Eury describes merely as species well known C. Suckowii, C. Cistii, C. Ramosus, C. Cannæformis and as species imperfectly known or doubtfull C. gracilis, Weiss. C. Gigas Brgt. C. pachydermis? Brgt. C. ancepts Weiss. Note that the last specie seem to be identical from Weiss fig. Gl. XIII & XIV.

Schimper describes I. C. Suckowii By and as syn. C. commune, Gtt. C. ramosus Art. C. nodosus St. C. carinatus, St. C. infractus, Gutb. C. æqualis St. C. undulatus St. & Asterophyllites foliosus (Lind) Gein.

2 C. Cistii, Brgt. without syn.

3. C. dubius, Arts. very closely allied to the former mostly differing by the sulcus costæ interpositus, lineatus.

4 C. approximatus Schloth. with syn: C. regularis, cruciatus, ornatus, Bronzeana C. verticillatus, approximatus, elongatus, Gutb. alternans, difformis, Petzholdii, St. biodermis Gutb.
C. varians, St.
C. Freudenbambinæ, Arts &c.

5 C. cannæformis, Schloth. with syn. C. decoratus, Brgt. Nodosus, Schloth C. Steinhauer Brgt.

6 C. decoratus. Sich. (not Brgt).

7 C. gigas. Brgt.

From the observations of my specimens I am disposed to admit:

1 Calamites Suckowii Brgt. the most common of the species.
2 C. Cistii, which I found very difficult to separate fro C. dubius.
3 C. dubius. Arts.
4 C. Cannæformis, Brgt.
5 C. Gigas. Brgt.
6 C. Pachydermis. Brgt.
7 C. Gracilis Weiss.

2. Calamites ramosus? Sp. specimen Ma 220 is a fine branch 22 cent long, from four to four & a half cent broad, with 5 articulations the basal one four and an half cent distant, the upper one a little more than seven cent distant. with flat distorted striæ rather continuous than alternating and more or less inflated but not distinctly bearing inflated small bolsters at the point of junction two of the articulations have one branch scar distinctly marked - but not inflated the flat striæ are two and an half & three millim broad and scarcely marked by lines. The branch is somewhat narrowed downward. I have another

specimen from Camello No 352. A stem 43 mm cent long, 7 to 8 cent. broad, flat, with only three articulations, ribs flat, broad 2 & 3 millim, with an obtuse (yellow) the ribs without striæ but covered with a thin coating of coal. It bears at one of the articulations one branch, oblique to the stem nearly 10 cent long without articulations two cent broad at the upper part but gradually narrowed to the point of attachement where it is only 1½ cent broad. The ribs are alternet at the articulations rarely inflated. The lower articulations are then marked with oral manullæ but they both look truncate or broken - See on this C. Ramosus Ait, as described by Grand. Eury. It is exactly the same as these species and should be preserved a species.

(1) Calamites subæqui, Sque. This is a good species evidently the same as has been described by Grand Eury p 31 with wood cut. I have received it from Camellos and other localities this season at St Johns.

[illegible] Brut. There is in the above specimens large piece of the [illegible] which we could not [illegible] articulations. In some of these specimens 45 cent or more of the cortex are absent the [illegible] parenchymatous [illegible] which is the upper part of the canine when decorticated generally [illegible] small. It more but sometimes especially when [illegible] The character of the rocks appearing under the [illegible] these which by specimens more latterly represent. - There is another [illegible] to sub or a [illegible] of [illegible] which has all the [illegible] from 1½ to 3 cent distant. The ribs extremely small, scarcely obtuse, [illegible] or none with the intervals as in C. dubius scars of leaves indistinct articulations small and not as in any C. disjunctus.

3. Calamites Cannæformis? Brgt. I can not indeed separate this species a rather small C. cannæformis a C. suckowii. Both specimens of Aldrich, 63 & 63c have the base of the stem. The first 22 cent long 5½ cent broad flattened 6½ cent. has the articulations, the two lowest 9 cent long, the 1 cent the upper, the ninth one 5½ cent long. Scars of leaves round oval either mamillæ convex or concave scars by the disjunction of the mamillæ are all placed at the top of the cortex, thickened being merely inflated at the articulation. The cortex at the base are broader 4 mill. those of the top only 2 millim, the cortex being continuous or rarely alternat. The bark is thin and thinly lined in the length. The bars bear sometimes scars of rootlet, few however. This agree exactly with Schimper description of this species which he considers as subcarboniferous. It is evidently C. Steinhauer of Brgt. But it does not agree with fig. 2 discripte of the species by Buchl. where the specimen must like our 63c is named C. suckowii, his al. Cannæformis pl. fig 2 bears without scars of leaves nor does it agree with them which he C. cannæformis represented without tubercles a scars and with cortex alternat much narrower and more rounded. In our specimens they are nearly flat and the canine very narrow. Ours is C. decoratus Brgt. Steinhauer. But not his C. cannæformis which has the base much elongated while in ours it is short round truncate a character of C. cannæformis [illegible] C. suckowii.

common rachis, as Goppert describes, our *Neuropteris hirsuta* is certainly not identical with it. For this very common and polymorphous species of ours, whose frond is sometimes 5 feet long, and at least tripinnate, and generally bears compound tertiary alternate pinnæ or pinnules formed of a large oblong or lanceolate obtuse leaflet, cordiform at base, having on each side, and attached to the base of its slightly elongated pedicel, a small round or veniform pinnule, which is as different in its form as in its nervation from the main middle leaflet. This one has generally a well marked, sometimes thick medial nerve, from which the veins go out, anastomosing and curving to the borders; while the veins of the small basilar leaflets all come out of an enlarged or circular base, without trace of a medial nerve. These leaflets are, therefore, true *Nephropteris*, while the main pinnule is a *Neuropteris*. We have obtained from various parts of our Coal Measures, where this species is the most abundant of all, numerous specimens which all show the same characters. The pinnæ decrease in size to the point, and the two upper leaflets under the terminal pinnule are simple or do not bear at the base the small round pinnules; all the others are compound. This terminal pinnule is large, round oval, obtuse and entire. On the other side, Prof. F. A. Rœmer has published in the Paleontographia (1860) p. 186, Pl. 29, fig. 4, a leaf which he considers identical with *Neuropteris cordata*, Brgt., though he calls it *Dictyopteris cordata*. It resembles one large leaflet of *Neuropteris hirsuta* by its form, and by the straight pointed hairs with which its surface is marked. But in the leaf figured by the German author, the veins and veinlets are undulate, and in curving and anastomosing, they pass from one to the other, forming a kind of reticulation, like that which characterizes the genus *Dictyopteris*. As this peculiar mode of reticulation is not remarked in our species, we have to consider it as different from *Neuropteris cordata*, Brgt.

Neuropteris fasciculata, Sp. nov.

Pl. v, fig. 1 to 4.

Frond pinnately divided, bearing alternate ovate lanceolate pointed leaflets, variable in size, irregularly rounded or auriculate at the base, being more extended on one side than on the other, or truncate on one side, and rounded on the other. Medial nerve distinct, and comparatively broad, either descending to the point of the leaflets, or disappearing at or below the middle, sometimes absent; veinlets thin, close to each other, scarcely distinct, arched, forking in ascending.

This species, by the divisions of the leaves, presents a truly peculiar appearance, which does not compare with any previously known fossil plants, except perhaps with some of the abnormal forms of *Neuropteris hirsuta*. It is evidently distinct from this last species, as shown by its smooth (not hairy) surface, its thinner texture, its more closely approached veinlets, by the pointed form and the peculiar division of the leaflets, which are generally united three together, and by a subdivision of the main rachis. In the specimen represented by fig. 3, the large leaflet has a well marked medial nerve, while the small ones have no trace of it. The specimen represented by fig. 4 is creased in the middle, but the secondary nerves come out from the broad, round base, as in the genus *Cyclopteris*. I consider it as one of the leaflets attached to a round, perhaps climbing stem, while the others represent the top leaves I have only seen of this species the four specimens figured here. Figs. 2 and 3 are from the bottom clay of the upper coal bed of Neelyville, Morgan Co.; the two others in concretions from Mazon creek, Grundy Co.

Neuropteris Collinsii, Sp. nov.

Pl. v, fig. 5 and 6.

The mode of division of this species is still unknown, as it has been found as yet only in separate leaflets. These leaflets are large, from two to three inches long, one and a-half to two inches wide, either oval in outline or oblong ovate, and smooth. The veins and veinlets are thin and distinct, inflated near the base, emerging from an oblique or horizontal truncate broad base, many times forking in ascending, and but slightly arched. The leaflets have no trace of a medial nerve, and could not, therefore, be referable to the genus *Nephropteris*, Brgt

But as it has been seen to be the case with species of this genus, other leaflets, taken from different parts of the same plant, may have another kind of nervation. Our species is related to *Neuropteris ingens*, Lind & Hutt., Foss. Flora, vol. 2, Pl. 91a, by the form and size of the leaflets, but it differs by the mode of division of the veins, which do not radiate from one common point, but ascend in slightly curving lines to the borders from an enlarged base, where they become parallel, resembling, in that manner, the nervation of an *Odontopteris*. In our species also, the veins, though inflated near the base, are not as distinct as in the English species, which is compared to *Neuropteris au-*

see 24627. small leaf. Characters good & persistant.

1. Neuropteris Collinsii Lsqx. The species is known as yet by cyclopteroid leaflets. They are not large, at least as seen from the specimens now on hand, three from Mazon Creek & three from Penn. Both leaflet figured pl 5 are from the State cabinet of Ills and are not on hand. The largest four specimens N 251 is oval obtuse, enlarged toward an abruptly cut broad base. 2 inches long not quite 1 inch broad in its broadest part. The others are cyclopteroid or round about as broad as long. Characters: texture of the leaflets thin generally cuneate plicate along the borders. Veins and veinlets as indicated in the description, forking about 5 times from the base to the borders where in the leaflet measured above they count 50 to 52 per inch at the margin. (It is still doubtfull if N. inflata of the 2 vol. of the Ill. Geol. Report is referable to this. The specimen is not in my possession. But as far as I can remember the substance of the leaves is thick & coriaceous and the veins more deeply marked through nearer to each other. One specimen of ours N. 246 might be perhaps referable to this N. inflata. The veins are more deeply marked, the space between them more inflated and they are more approached to each other measuring on specimen N 246 about of the same size as N 251, 80 to 82 veinlets per inch on the borders. N. German of the Penn. Report and N. inflata are still indifferently known and are therefore species as not doubtful.) — The above remark in ( ) is to be erased and

2 Neuropteris inflata Lsqx considered as a distinct species from the former. The leaflets are very well marked, inflated at base becoming thin to the borders where they count 50 to 52 per inch (or more) the nervation is inflated or convex the specimens thin and therefore the leaflet often cuneate and at the border the veinlets are often erased and obscure. — After reexamination and comparison of the specimens in my possession viz: N 206. Lg. N 251, N 387. 388, 389. 390, I can not a marked difference nor point out a good character to separate N. inflata from N. Collinsii, if N. 206 is the true N. Collinsii which I think it is. It is therefore better to refer them to the same specie which is as far as it is known till now, only a Cyclopteris or rather Nephropteris. 24. 7. 71. — Since writing the above, I have obtained from Strong a fine specimen N 462 representing the terminal leaflet half buried with two lateral leaflets at its base; the rachis is thick 1/10 of an inch, about, ascending into the base of the terminal leaflet into a broad medial nerve which pass out in a point and disappear at 1/4 of the leaf. The terminal leaflet appears oval-obtuse? Surface of the leaf cuneate in the length, its substance apparently thin, characters of the veins and veinlets as described above. The lateral leaflets are attached to the rachis by a broad base, the leaflets marked in the middle by a depression rather than by a medial nerve are round oval about 1/2 inch long, a little more than one inch broad with veinlets thin not inflated to the base but marked at the base by inflation of the leaflets. The surface has not any hairs. This species is recognizable at once by its proportionally broad rachis which is nearly smooth, merely marked in the middle by a deep narrow furrow. 3/11/71. Should be separated from N. Collinsii. Compare Fig. 1a-1c, Conchaceen-Gatt. d. Kard. p 227 Pl. XXII f. 3-5.

3. Neuropteris inflata Lsqx. Al. 14 & 15. These specimens represent the species in a form which I have not seen before and which may be reputed as a new species or a var minor. They represent fragments of ultimate penna with subopposed pinnules attached by a broad base to a comparatively broad rachis, slightly turned upwards or at an open angle of divergence narrowed at the upper base border to the rachis, enlarged at the lower one without middle nerve but a broad scarcely noticeable depression in the middle, inflated both as are also the veins which are inflated at the base, very thin toward the border and somewhat undistinct as if mixed an appearance remarked the same upon the specimen N 462 described above. There is no trace of difference whatever neither in the nervation, nor in the form of the leaflets which are oblong very obtuse, 10 to 15 cent. millimeters long and 6 to 8 millim. broad. I can not see any character to separate these. Veins 30 to 34 per cent along the borders, inflated irregular, mixed and as separated by one or two very thin veinlets. Decurrens right. A specimen of Aldrich from Monticello Penn is referable to this species. Nr of the var minor out part of a penna

1 Neuropteris tenuifolia. Brgt. It is possible that we have here two species with about the same form of leaflets, one with thicker more coarse leaflets and coarser nervation and another with thinner substance and thin leaflets No. 110 a specimen from Carnegie Penn. Represents a pair of fronds narrowly triangular about 16 cent long with close slightly imbricate pinnae turned upward straight some of them flexuous or recurved the lowest twelve cent long, rapidly diminishing to the upper ones when the specimen is broken and which are only three eighths an inch cent long. The form of the pinnules and also of the terminal one is that of N. tenuifolia but the substance of the leaflet thick and subcoriaceous this should be compared with other specimens from other localities, those of the Mount Creek and Tunnel near for example

2 Neuropteris flexuosa. No. 4 XX d 5 10 These two specimens evidently represent the species. the last exactly like my fig. 9 of Pl VI. the other the top of a pinna unhappily broken with a narrow flexuous rachis, grooved in the middle, bearing a lower nearly round leaflet ~~near~~ three and an half centimeters across and a top leaflet, lobed ~~as the upper one~~ on one side the other is the upper pinnule with the peculiar venation of the species, both in the upper pinnule with the peculiar venation of the species,

Neuropteris. – Number of veins in one centimeter along the border

N. decipiens. 30.–32. per centimeter

N. Clarkii. 32

N. hirsuta. 40

N. cordata d'orbigni fol. 50–60.

D1. Neuropteris gigantea Bngt. see for this species description and figures U.S. pl. 161 & 162. All I know about this species is mentioned in the description. I see that the leaflets appear inflated at the margins. 8.7.71. It does not agree very well with Schimper's description; the pinnae being rather alternate than opposit and the leaflets scarcely cuneate at base. Nevertheless the appearence is the same as in Heer's figure. 10.7.71.

D2. Neuropteris Grangeri Bngt. From the figure of Bronguiart the species p. 237 pl. 68 fig 1. is not the one which I described above p 383b 3. Our species has the leaflets oblong not enlarged at the base, of the same form as those of N. Loschi but longer and distant. The veinlets are valde notates as said by Bronguiart. It is evident that N. Grangeri & N. Cistii of Bngt are the same species and that we have as yet for it representative the only small specimen n. 39c figured as said above. It is pour pl. 161 fig 6 & 7. Therefore the name of N. Grangeri ought to be changed. Specimen n 115 b. has a pinna just with the same form of leaflets and nearly as marked veinlets as specimen n 9 Foss. U.S. pour pl. N 115 fig 6 which I considered as N. Cistii together with a pinna of larger leaflets and a Cyclopteris. On another specimen n. 67 there appear to be some leaflets horizontally cut at base as they are in Bronguiart's figure of Neuropteris Cistii Pl 70 fig 3. It appears therefore that we have only one species & that all our specimens may indifferently represent Neuropteris Cistii or N. Grangeri. They are all put together in drawer under the name of N. Grangeri. 7.8.71.

D3. Neuropteris tenuifolia Bngt or species distincte. Specimens n 31, N 31a. N 31 b, n 403. A specimen from Mazon creek, N 479 has leaflets somewhat pointed and also more enlarged at base with a broad medial nerve like those of Bronguiart's figure but proportionally longer. The nervation of the small species whose leaflets are smaller than those of Neuropteris Loschi more inclined and more decurrent on the rachis toward the point is especially marked by the pointed form of its inferior leaflets which expand downwards to a point. The veins & veinlets are more distant and not quite so arched as in N. tenuifolia to which it resembles. 7.8.71. The nervation is the same as in Pl. 115 fig 1. and the inferior leaflets are quite different in form, the upper leaflets more inclined and more decurrent and the leaflets generally broader & shaler. It is separated in drawer with specimen n 35 from Johnstown.

D4. Neuropteris sp: nova? Specimen N. 35 from Johnstown a number of them all representing separate even half broader leaflets which do not give a satisfactory idea of the species. The leaflets are broad at base, narrowed upward to an obtuse point, no medial nerve visible, veinlets very thin very close to each others, denser and more numerous than in any of the other species known from our coal measures, scarcely arched. Perhaps referable to N. obscura.

D5. Neuropteris Grangeri? Bngt. There is in the Coll: of Easton college a specimen with a branch of Neuropteres fig. p. 531 fig 10 with broadly ovate leaflets enlarged at base, sessile, obtuse at point with thick veins as marked in figure mostly branching once and therefore somewhat distantly attached to the middle nerve in the upper side, to the rachis at base on the lower, which may represent Neuropteris Grangeri. The point of the leaflet is as marked in my figure. On right side should be completed. In the base, the leaflet round first toward the rachis on the lower side and then are slightly decurrent.

D6. Neuropteris tenuifolia Bngt. The specimen N. 13 from Montevallo rein of Alabama belong to this species the terminale leaflet is comparatively long, 7 mill: very narrow 1½ millim in the broadest part lanceolat pointed, the upper veinlet are very small, decurrent and the nervation very thin but distinct. Agree fully with the description. Remarks on the two forms figured the one with rhomboidal short terminal leaflet and lateral leaflets oblique right angle to the rachis with truncated base and the other with terminal leaflet long lanceolate, lateral leaflets oblique right angle to the rachis with truncated base.

D7. Neuropteris subfalcata. I have described it as N. subfalcata (B 13 N 32 and figured it from large leaves from Helena. I have from Montevallo two small specimens. Al 31 & 32 whose leaflet is right angle to the rachis which is narrow have about the same form, at least the same equal base, borders antiquous or imbricat. The leaflets are only 12 millim long 4 mill: broad oblong or linear oblong. The specimens are too poor for positive identification. I believe however that they represent the same species.

D8. Neuropteris Grangeri. I have seen a good specimen of this species agreeing with Bronguiart's fig. 2 description of N. Grangeri Lx. Cistii at the Valenciennes near Denain August 1876.

1. Neuropteris Loschii Brgt. The description already made of this species - Penn.a Geol. Rep.t 1858 and U.S. Foss. fl. with the figures of this species are wrong or incomplete. The frond is at least tripinnate, large, triangular, pinnæ long, linear lanceolate with both secondary and tertiary rachis striate; pinnules alternate attached to the rachis by a broad pedical, short, oblong, very obtuse, proportionally broad, varying in length from 1/4th to 1/2 of an inch, three or one fourth as long as they are broad, close to each other, somewhat inclined to the point of the pinnæ nearly truncate at base with the inferior lobe slightly elongated. Terminal pinnule proportionally large, ovate, obtuse, entire or slightly lobulately lobed in the middle lower and inferior pinnules longer, reniform or oval. oblique passing to the cyclopteroid form. Medial nerve marked by a basilar depression marked upward to about one fourth of the leaflet. veins somewhat distinct and inflated near the base, dichotomous, forking four times in the small leaflets much arched and therefore perpendicular to the borders at the point where they reach them and there also very close and undistinct. The surface of the leaflet is always smooth or polished. Its characters are preserved in every specimen seen as yet. 7.7.71

2. Neuropteris rotundifolia? Hemb. ? is the species represented by the small spec. N. 41 and figured U.S.F. Pl. 15 fig 10. Though the medial nerve is more marked and longer than in N. Loschii, the veins and veinlets thinner but more distinct and not inflated toward the base and though also the leaflets are opposite, this species might be a variety of it or of N. Loschii. It is comparable to nothing else. See what Sternberg says of its N. rotundifolia. It might perhaps be also N. jendani, but though somewhat like it by the nervation, the form of the leaflets and their position are far different. 7.7.71, See 2b. leaflet count 8-10 veins per centimeter at the base

3. Neuropteris Grangeri? Brgt. This species if it is that of Brongniart is separated from Neuropteris Loschii by its narrower rachis, the leaflets more distant, the space between them being often as large as the width of the leaflet, by the form of the leaflets proportionally longer, nearly oval, not abruptly cut at base be rounded at the upper base, by the terminal leaflet lanceolate, distinctly pointed enlarged in an obtuse scarcely marked lobe in the middle and especially by the veinlets which are more distinct near the borders and not inflated at base. Though these characters are marked upon every one of the specimens which I collected at Port Carbon, N. 112 has nevertheless the terminal leaflet slightly shorter and more obtuse and N. 104 still more so, showing thus a close affinity with N. Loschii. It is true that in the last No the terminal leaflet appear to have been folded and does not show its whole length. 7.7.71. It is impossible to say positively if this is N. Grangeri or N. Cistii. N. 115a which by the distant leaflets, the locality veins &c is referred to this species has terminal leaflet shorter and more pointed with the upper leaflet longer lanceolate pointed on one side and short obtuse on the other while N. 115b which has the terminal leaflet and the nervation of this species has short lateral leaflets generally close to each others. though not as much so as in N. Loschii. This is a good and distinct species see p. 383 c. 2. 17.7.71

4. Neuropteris Cistii Brgt. The only specimen seen as yet of this species is N. 9 exactly figured U.S.F. Pl. 15 fig. 6 & 7. It is easily separated from the three former species by the oval form of its leaflets nearly equal and rounded at base distant, with a basilar medial nerve, and sharp, very distinct veins, forking three times and therefore more distant than in the former species. The terminal leaflet is not known.

5. Neuropteris rotundifolia? Hemt. is evidently N. Capitata Lsqx Pl. Penn. Geol. Rep. Vol II p. 383. N. 41 which has the leaflet mostly opposite or more form and nervation agree entirely with N. 41 pl. pl. 15 fig 10. U.S.F. pl. See Brgt Pl. 70 fig 1. with leaflets alternate. P. 856 N. 41 b is what he has mistaken for

6. Neuropteris tenuifolia Brgt. (Cyclopteris elegans Lsqx. Penn. Geol. Rep. Vol II p. 856 fig. 45 is a description and figures of this species. U.S.F. Pl. N. 12. and for description of the Cyclopteroid leaves. Geol. Rep. Penn.a p. 856. Both these descriptions are good as about so far as they go. The description of this species in the Penn.a Geol rep. P. 858 is worth nothing. The frond is unknown as well as the position of the pinnæ relatively to it. Except if specimen N. 31. of U.S. Pl. 11 fig. 12 belongs to this species. This specimen Cist N. 106 which comes from the same place indicate the frond as triangular and the pinnæ pleasure regularly attached to the main rachis in an open angle or nearly perpendicular to it. The leaflets of N. Tenuifolia are decurrent near the point of the pinnæ twice as long as they are large, &c: see description. The veins branch 4 to 5 times accordingly to the size of the leaflets, very distinct from N. Loschii, and other parent species by the length of the leaflets the veinlets less arched more distinct though very thin, the terminal leaflet pointed. N. N. 31 belongs to this species the inferior leaflet and its peculiar form is another character which separates this species from its congener. 8.7.71. N. 114 is also referable to this species though the leaflets are shorter. It has the pinnæ very oblique on the rachis but proportionally very long. #1 though this impression would thus be identical. (see 383 c)

riculata, Brgt., a plant which has not yet been discovered in our Coal Measures. The two specimens figured in this Report, have been found in the concretions of Mazon creek, the first one, fig. 5, by Mr. John Collins, to whom the species is dedicated. Other and larger leaflets of the same species have been obtained from the same place.

NEUROPTERIS CAPITATA, Sp. nov.

Pl. vii, fig. 1, and Pl. viii, fig. 1.

FROND or part of frond bi-pinnately divided, triangular in outline or tapering upwards from an enlarged base; pinnæ linear, with alternate, oblong, short, very obtuse, broad, contiguous pinnules, and a proportionally very large triangular obtusely pointed terminal leaflet, obtusely lobed on each side near its base. Medial nerve, none; veinlets scarcely visible to the naked eye, coming out from the narrowed base of the leaflets, strongly arched towards the borders, with numerous bifurcations. At the upper part, or near the point of the frond, as seen in Pl. vii, fig. 1, the pinnæ become shorter, less divided, and at last mere pinnules attached to the rachis by a broad pedicel. All leaflets are unsymmetrical at the base, being auricled or elongated downwards, or toward the main rachis, and merely rounded on the other side.

The general appearance of this species is somewhat similar to that of *Neuropteris Loschii*, Brgt., from which it is readily distinguished by its proportionally broader, round-topped pinnules, more abruptly cut at the base, its polished smooth surface, and the large terminal triangular leaflet. The large specimen figured is from Murphysborough; the other has been found in concretions at Mazon creek. The same species is abundant in the roof shales of the main four-feet coal bed at Yellow creek, Ohio.

Neuropteris fimbriata, Lesqx.

Pl. vi, fig. 4.

Cyclopteris fimbriata, Lesqx.

Journ. Bost. Soc. Nat. Hist., 1854, p. 416.

This species has also been published in part, and from isolated leaflets, in the Geol. Rep. of Penn., p. 855, Pl. iv., fig. 17 and 18, as a *Cyclopteris*. The specimens now on hand represent it with a pinnate frond having an undulating, flexuous, round, finely striate rachis, marked with points as if it had been scaly, which bears alternate, distant, broadly oblong or ovate, sometimes nearly round leaflets, entire at the round auriculate base, attached to the rachis by a broad pedicel. These leaflets are finely fringed from the middle upwards by long, undulating, narrow laciniæ. The veins which come out parallel from the broad pedicel and divide three or four times in ascending, are thin but distinct, slightly arched towards the borders and ascend to the top of the fringes. The specimen figured here from the concretions of Mazon creek, and found by Mr. S. S. Strong, seems to show that the species was a climbing fern resembling by its nervation and its mode of division a *Lygodium*. It has been supposed that the fimbriate leaves were the fruiting part of a species, which in its sterile form has entire leaflets, as it happens with some ferns of our time. But the fringe is not inflated, and the laciniæ, though very distinct in some specimens, do not show any trace of remains of sporanges. Like the former species, this one is, by its nervation, a *Nephropteris*, at least so far as it is known. It varies much in the size of its leaflets, some being still smaller than those figured here, while most of the others found detached from the stem, and which are broad oval or nearly round in outline, are about two inches or more in diameter. It is one of the finest and rarest species of our Coal Measures, though it has been found at different places over the whole extent of the N. American coal fields. When this species was first published, no plant of this kind had yet been found in the Coal Measures of Europe, but recently Prof. Heer has given in his *Urwelt der Schweiz*, under the name of *Neuropteris lacerata*, Heer, l. cit., p. 12, fig. 11, a species which has a near relation to ours. It is a round leaflet, bordered by a narrow fringe, which, unlike ours, is nearly regular with equal narrow divisions. As far as can be seen from a mere woodcut, the species is a truly different one. Prof. W. P. Schimper, in his *Palæontologie vegetale*, seems to consider both species as identical, for he says of *Neuropteris* (*Cyclopteris*) *lacerata*, Herr, that it is found at Saarbruck and in some places in North America. If both species are identical, our name has the

1. Neuropteris fimbriata Dgs. N. tenuinervis Dgs. N. dentata Dgs. Penn. rep. &c. Then three species are very difficult to separate and perhaps with better specimens they may be found to be only one species. Neuropteris fimbriata in its natural form or in its small penna as seen in U.S. Foss. fl. pl 15 fig 1. has a tripinnate frond. Penna apparently large, triangular in outline with alternate nearly linear slightly lanceolate pinnæ with alternate, oblong, obtuse leaflets, slightly decurring at the top of the rachis, pinnæ oblong, obtuse, rounded at base, slightly more abruptly cut at the lower internal lobe, attached to the rachis by a broad base, varying in size from half an inch to one inch or more with veins more or less emerging from the base of the leaflet deviding or forking twice or thrice in cursing to the borders, medial nerve none or merely basilar and rudimentary. Veins & veinlets thin, but distinct and somewhat distant. Rachis finely striate and equally so in its whole thickness without medial inflation or depression. In specimen fig. pl. 15 loc. cit. of separate pinnæ with leaflets a little more than half an inch long, but two of them slightly somewhat fringed at the top, indicating identity of the small form with simple leaflets with the large one with fringed leaflets. Generally the veinlets, at least in the cyclopteroid leaves are much inflated at base. — Neuropteris tenuinervis is not satisfactorily known. Its certain representatives in our specimens is the one fig. Pl 15 f. 7 of the Penn. report and another N. 11. both of the same locality. The leaflet are irregularly oval-in N 11 appearing irregularly deeply undulate and short fringed at the point. In N. 11. the largest leaflet is large, deeply cut and irregularly lobed but the point is broken and not seen. All are marked by the thin medial nerve as marked in fig. 2 description of the Penn. rep. As in the former species the veins come out from a broad base, but they are not inflated below as this is in the former species, less distinct and more approached. A large leaf fig 10 referable to this species is enlarged from a broad base than lanceolate obtuse with short fringe at the point. — Neuropteris dentata as represented by specimens N. 85 & N. 1119, none of those pulled in the Penn. report being in my possession, is still more difficult to separate. The leaflets are proportionally longer, twice as long as they are large, ovate-lanceolate, of a thicker coriaceous texture near the top in short, irregular lacinæ, with veins flabellate branching from a broad base, scarcely arched therefore appearing like leaflets of odontopteris inflated and very close to each others. Both specimens may invalidate the separation of these species as furnishing distinct characters. I see how many times the veins branch in small leaflets of Neuropteris fimbriata and marked it in its character.

2. Neuropteris undans Dgs. Geol. Rep. Penn: Cyclopteris undans p. 855 pl 4 fig. 19 to 22 & Neuropteris undans. loc. cit. p. 859. pl 5 fig. 1 & 2. Brook jon. fl. pl 16 fig. 1 to 5. Frond tripinnately divided. Pinnæ long, linear-lanceolate. Leaflets come to each other, the borders generally overlapping each other varying in size from half an inch to about two inches, the large ones lanceolate-obtuse from a round cuneated base, the inferior lobe slightly longer; the small ones oblong obtuse, all attached to the irregularly striated rachis by a broad base or pedicel, and more or less undulate on the borders. Medial nerve scarcely visible, merely basilar, with veins more or less emerging from the base of the leaflets inflated at base (generally pustulate) arched, and much divided in ascending in leaflets fig. in 1 long three fourths of an inch) becoming very close though distinct at the borders. Cyclopteroid leaflets broadly oval or nearly round, marginate or irregularly undate at base by rounded auricles with the margins deeply undulate or irregularly serrate at the top. Veins flabellately form divided among very slender and close toward the border, united in pairs and the pairs inflated toward the base &c. I consider this as a very good species characterized by the form of the leaflets the nervation &c. The veinlets and veins are quite arched and though very close at the margins, still distinct. The species for its thick medial nerve may be placed after N. fimbriata.

3. Neuropteris plicata? Penn. (or spec. nov.) Frond bi or tripinnate. Pinnæ lanceolate pointed, leaflets alternate or opposite, open nearly perpendicular on the irregularly striate rachis, oblong oblique or slightly lanceolate obtuse slightly decurrent sessile or attached to the rachis by a broad pedicel with the base horizontal or truncate and the inferior lobe slightly elongated. Medial vein marked as in N. tenuinervis by a thin filament ascending 2/3 of the leaflets. Veins more or less flabellate are emerging from the broad base, often obscurely seen through the thick parenchyme, branching 6 times in the large leaflets 1/4 inch long arched to the borders though not quite as much as in the former species. The borders of the leaflets are slightly undulate. But it much differs from the former by their more distant less arched veinlets &c. I have seen only two specimens of this both figured U.S.F. fl. N 13 f. 1 & 2. both from Gomery C. It is also comparable to N. tenuifolia Bryt. But neuration and thickness of the leaflets show a different species. Bryt. Stemby. Penn: Rep: pl XX fig 3 good figure. Lyco a 57.71.

1. Neuropteris gibba? spec. nova. Has about the same forme, pinna and leaflets as the former. Pinnæ long, linear, sinuate horizontal, truncate at base with the inferior lobe slightly longer, varying in size from half an inch to a little more than one inch, obtuse equal rotundate, slightly enlarging above, medial nerve broad flat as covering to 2/3 the leaf scarcely arched except near the base straight, thin, visible very low. Texture of the leaves thick, surface inflated. Except it differs from the former merely by the slightly more obtuse terminal leaflets more often and equal leaflets, venulets rarely arched or straight from the upper middle of the leaflets. Specific difference may be caused by the difference of the substance of the leaves. Fig. 3 et 4 Pl. 13 Ch. S. fl. below is this species. 5 & 7 I made drawing of this species. See Neuropteris gibbosa sept. Nov. 1858 Pl. V fig 3. See p 386 (1).

2. Neuropteris flexuosa. Brgt. appear to be the species represented by specimen No 30 & 31. The form of the leaves is that of Pl XIII fig 1 N. plicat. in U.S. flor. with the nervature coarse however and the mid rib broad and flat. Comparable also to N. subfalcata Pl VII fig 5 & 6 but differing by broad rachis coarse nervature leaflet not turned up etc. The leaflets however especially in specimen 31 are distant or separated and somewhat like those of N. plicata, the lower base of the leaves being however less distinctly auriculet than in plicata. See p 385c (1).

3. Neuropteris hirsuta? fuentes? A small specimen in the collection of New Brunswick No 15? has the veins inflated in the middle a marked by an oval protuberance resembling fructifications or sporidiæ. It is about like those marked by Brongniart, but the borders are slightly upturned and the middle concave. They are parallel to each other as in this

4. Neuropteris ~~cordata var~~ angustifolia?? Brgt. I have from Manspiden No 8b Lme 45 with other specimen less valuable two specimens the first representing a crushed penna with small crate pinnules at the base of large one lanceolat obtusely pointed, more or less unequal at the base which represent by its form exactly Brongniart's species of ~~cor~~ angustifolia except that the middle leaflets are much larger. Brongniart remarks however that in his ~~cordata~~ species the veins are very distinct and very distant (très marquées & très espacées) a character which evidently separates evidently this species from the European one. For, if the middle nerve is very thin as remarked by Brongniart, for his species, the venulets are also in ours very thin and close, measuring at the borders 93 venulet at each in one inch. This character would identify these leaves of Mansfield with N. hirsuta Lesqx and indeed I see one or two distinct hairs upon the surface of the leaves of the large specimen 8b

Compare 386b. 3 On another red Brgt slate of Mr N. Scheuchzeri which bears part of the preceding which join all the base of this group to the rachis nervuli tenuissimi arcuate dichotomi ~~arcuate~~ approximates and remarks in this N. angustifolia. Nervuli pluries dichotomi arcuate tenuissimi, approximates that this species perhaps a mere variety of the forme N. Scheuchzeri. I have therefore to omit entirely N. cordifolia which is as yet unknown to me except perhaps this represented by Neuropteris decipiens which however has the leaves very pillous a thick middle nervule etc. and to admit N. hirsuta, with its character N. angustifolia = N. Scheuchzeri which may be a var of N. decipiens and N. decipiens. N. hirsuta is represented at Cannelton in my manifold collection by leaves of the same character. In N. angustifolia the middle leaves are very variable in length. Specimen 8b has

them from 5 to 10 cent long an 1½ to 20 mill broad at base above the leaflets which are nearly round, truncat at base, 2 millim across, both ways, becoming larger in descending and the pedicel is about as long as these leaflets are large, from 5 to 8 millim. long. Most of the leaflet are obtuse rounded at top or obtusely pointed (this is the point of the large leaflet, or dat to truncate, equal or very unequal at the base. In all the midrib is very thin, effaced a little below the point. The large separat leaflet is eleven cent long 2½ cent broad, just above the very unequal base from which point it very gradually narrowed to the point or top see p. 467.

1. Neuropteris flexuosa Brgt. We have in Mansfield specimen Ma 1078. part of a penna, one side only with five leaflets; pinnules approximate imbricat oblong curved (arcuate) obtuse with the lower angle of the leaflet more or less expanded pinnule terminale large (triangular lanceolate) ovate lanceolat. Brgt with veins very thin dichotomous (Brgt definition) agreeing with Brgt description and figure and bearing of inflated leaflet veins upon the just as these of Pl. 65 fig 3 and 3c considered by Brgt as young specimen. Though Brgt says of the terminal pinnule that it is ovate lanceolate, his figure shows it enlarged in the middle and lengthwise rhomboidale. The crowded imbricated leaflet, with veins coarse than in N. tenuifolia, but more divided and close, forking 4 times, inleaflet 3 cent long, inflated toward the base from the middle downward and with a thick midrib appear as described by Brgt. In my plate U.S. Pl. V. fig. 2 & 3 the form of the terminal pinnule is about the same and in some specimens with large pennæ, these are perpendicular to the rachis and also in fig 2 the rachis is thick and flexuous. But here the leaflets are distant, thinner forking two or three and not inflated toward the base. (It may be that fig 2 represent also N. undulata, but the terminal pinnule though sub rhomboidal in the length is pointed as in N. tenuifolia whose leaflets also are generally smaller). In comparing Ma 30 & Ma 62a both specimen with large leaflets like this, distinct and separated in both, I find the veins of N 30 closer more divided. But they are inflated in both forms and that is the greate division only which separates them. These specimen are very much alike N. flexuosa & N. tenuifolia and very difficult to separate; at least in the middle leaflet of large pennæ where the terminal leaflet is not visible. I have now Sept 76 received from Prof White a number of specimens Da 1 to 6 catalogue p. 56 representing the genus with straight or flexuous rachis of the pennæ especially flexuous toward the top and straight for the broader rachis with pinnules either in right angle to the rachis especially when larger or inclined upward the separated or imbricate and with the terminal pinnule ovate, obtuse, enlarged in the middle but very obtuse and short generally. Least. For in one specimen Da 6 f. the terminal leaflet is longer and more taper pointed or less obtuse. By the character this specimen is certainly that of Brongniart and somewhat variable. The leaflets of the distinct or imbricate are oblong, very obtuse, enlarged in curve at the base, especially in the lower side. Many of the specimens represent that inflation of the veins supposed by Brgt to be fruit. They are in some very regular but evidently caused by sulphuret of iron in specimens Da 8 & 8a, for in some specimens the granulations produced by sulphuret are marked upon the specimen where there is no trace of leaves.

1. Neuropteris vermicularis Lesq. The description is not quite right. To it add for the position of the leaflets: that they are perpendicular to the rachis (spreading to) except near the top of small pinnae (I have seen them inclined upwards only in the small specimen pl VI fig 3. which belongs to Springfield coll.) And nearly round at the base, say; and nearly round or truncate at the base with the lowest lobe slightly elongated. For the nervation say: the veinlets thrice forking in entering to the borders, deeply marked by, distinct on by maceration &c. - The main rachis is broad, straight, the middle part minutely and slightly striated, both borders flat and smooth. This character is not marked upon the figure which is therefore is incorrect. For the balance, the figure is right. (24. 6. 71). For this species compare figures in U.S. pl. VIII fig. 5 to 9 and those of Pl. Vég. pl. 4 bis VI fig. 3.

2. Neuropteris alpina Ettings. Adiantoides crenata Gein. Schimper Tal. p. 457. I believe to be right in referring to this species specimen No. 112 of our collection (which is also the same as pl. I fig. 1 which was copied from a specimen belonging to Mr. Lesquereux of Newark and published by him. Our specimen agree very well with the description and figures of the European authors. There is nevertheless some difference in Schimper's description. He says: pinnulis majusculis dense confertis and imbricatis; pinnula basilaris interna magis pendula inaequaliter rotundato biloba, both character not as yet observed in our specimen. The characters are as follow: Frond tripinnate primary pinnae apparently long and triangular. Secondary pinna long lanceolate or linear lanceolat tapering to an obtuse point by a long linear lanceolat obtuse terminal leaflet. Division or leaflets oblong, obtuse, entire, attached to the rachis by nearly their whole base, rounded or both sides a slightly auriculate on the internal base narrowed varying in size from 1/4th of an inch to one inch and an half. Medial nerve distinct; secondary veins emerging from it twice dichotomous. The veins, as must on the form, size and position of the leaflet, also in the mode of nervation. The main rachis is very broad, marked by three or more equal thick or two close to each other. The leaflets are generally separated, in one specimen at least sometimes distant as in fig. 2, but never imbricated. In the upper part of the primary pinnae or of the fronds the pinnules becoming shorter sometimes round are continuous and toward the point of the pinna become more and more connate, forming at last a long linear obtuse slightly lobed terminal pinnule. These upper pinnules have their nervation from the rachis which in the pinna becomes a true medial nerve as it happen with species of Alethopteris. But this can not be considered as forcing the character of Adiantoides to the species and I consider it either as a true Neuropteris or perhaps as Schimper says: a Hyecia of his new genus Leuropteris.

3. Neuropteris remotifolia Bgt. Lesq. and descriptions of this species, U.S. Rep. p. 414 pl. III, 11 fig. 11 a. Resembles well the specimen No. 113, which has some pinnules just like those of Bourgmont figure 2 p. 64 and at the same time some figures representing pinnules of Neuropteris elegans? ours No. 111 is a good illustration. Another specimen No. 113 bis seems to indicate analogy of forms between Neuropteris Planchardi and N. remotifolia. This species the specimen of these species is very different.

4. Neuropteris Agassizii Lesq. (sp. nov.). Polypinnate? Pinnae long (last of one upon three No. 113 measures 11 inches) linear lanceolate, bearing alternate or opposite combined sessile leaflets of large size one to two inches long, 3/4 of an inch to 1 inch broad ovate - elliptical in outline, rounded at base, opposite often adnate by their acute recurved horizontal pinnae terminal to a round obtuse; Borders entire or the upper is equally serrate except along the lowest; Medial nerve well marked and the veins emerging from it, twice dichotomous, veinlets going to the point of the teeth in curving according to the breadth of the leaflets. It is a species which in its small form seems to pass to N. crenulata & N. Hilli pinnatifida but well distinct from both not only in the form and dissection of the leaflets but in the veinlets in ending to points of the serratures &c. 14. 7. 71. Mallepierre.

5. Neuropteris Herbenaefolia Lesq. see description & figure opposite p. 385.
Description is satisfactory. Species far different from any of these sixteen, though the nervation is still the same. Differ most from the two former species by the form of the leaflet rounded at base;

right of precedence, and should be preserved, it having been published, with description, in 1854, in the Journal of the Bost. Soc. Nat. Hist.; and in 1858, in the Report of the Geological Survey of Penna., with figures and description, while Prof. Herr's species was published ten years later.

NEUROPTERIS VERMICULARIS, Lesqx.

Pl. vi, fig. 1, 2, 3.

This species, described in the 4th vol. of the Geol. Report of Kentucky, p. 434, has not before been figured. The frond is apparently tripinnate, with linear lanceolate somewhat obtuse pinnæ, and alternate, oblong very obtuse leaflets, placed at a short distance from each other. They are slightly narrowed in the middle, turned upwards or a little scythe-shaped, and nearly round, and equal at the corners of the base. The terminal leaflet, fig. 3, is oblong obtuse, regularly and equally undulate-lobed on both sides. The nervation is particularly distinct, the medial nerve being short and thick, and the veinlets distant, twice forking in curving to the borders, round, deeply marked, easily detached from the substance of the leaves, polished and thus appearing like pieces of rain worms. The main rachis is broad, straight, and irregularly striate. The general appearance of this species is like that of the large forms of *Neuropteris rarinervis*, Bunb., but its nervation is ~~far~~ different, the veinlets in this last species being flat, or looking as if formed of two parallel lines.

Found in the concretions of Mazon creek.

NEUROPTERIS VERBENÆFOLIA, Lesqx.

Pl. vi, fig. 5 and 6.

FROND pinnate; rachis round, slightly and regularly striate; leaves alternate, varying in length from half an inch to four inches and a-half, proportionally broad, ovate lanceolate-obtuse in outline, truncate at the base, regularly ~~serrulate~~-toothed on the borders, attached to the rachis by a broad pedicel, medial nerve narrow but distinct; veinlets distinct and distant, thin, moderately arched in ascending to the borders, forking twice, the last divisions descending to the point of the teeth.

386 1 (2)(26)

The figure and description given of this species in the 2d vol. of this Report, p. 431, pl. xxxvii, fig. 1, are imperfect, being made from the only specimen found at the time. Better specimens now on hand show that this fern evidently belongs to the genus *Neuropteris*, not only by its nervation, but by its ramification and the position of the leaves on the rachis. The species nearest to this is *Neuropteris crenulata*, Brgt., easily distinguished by its elongated narrower leaves, with crenulate rather than toothed borders, and the thickness of its veinlets. Our fig. 5 represents a specimen whose upper leaflets, scarcely dentate, have the surface wrinkled around, and marked by points of irregular size, placed without order, which resemble traces of fructification, the epidermis appearing as if it had been perforated by glomerules of spores placed under it. This peculiar appearance may result from the process of maceration. It is too obscurely marked to merit more than a passing mention.

386. 3.4.5.

NEUROPTERIS RARINERVIS, Bunb.

Pl. viii, fig. 1 to 6.

The specimens figured 1 to 4 on this plate, from the concretions of Mazon creek, bear round leaflets, apparently attached on both sides of a secondary rachis, as are generally the pinnules of a *Neuropteris*. According to this appearance we should have not only to consider these leaves as representing a new species, but also to accept the genus *Nephropteris* or *Cyclopteris* for their classification. But I think that the parts represented in fig. 1 and 2, are not fragments of a secondary pinna with alternate pinnules attached to it, but only parts of primary pinnæ with the basilar leaflets of the secondary pinnæ attached to them, in the same way as such leaflets are attached along the rachis in fig. 6, which represents a fragment of pinna of *Neuropteris rarinervis*.

This remarkable specimen is also from Mazon creek. As is easily seen, it shows a primary rachis with the base of its divisions marked by the remains of the secondary branches and the two basilar leaflets on each side of them. If this branch were longer, we should see these basilar leaflets more and more enlarged, becoming round farther down, and then showing the same forms as we see on fig. 1 and 2. In vol. 2, p. 429, in a foot-note of this Report, mention is made of a specimen from Newport, R. I., which bears on the same part of a frond two round cyclopteroidal leaflets attached at the axil of secondary pinnæ, while the same pinnæ bear true neuropteroidal oblong pinnules, with a medial nerve. As this specimen elucidates the position of the two kinds of leaflets, and as it is the only one found as yet elucidating this peculiar difference, I have figured it fig. 5, as affording the most conclusive representation of the unity of both the genera *Neuropteris* and *Nephropteris*. This figure, I

D. 1. Neuropteris tenuinervis Lsqx. Penn: geol. report. I. 859 Pl. 5 fig. 7 & 8. This species is a good well characterized one. It is represented in the nodules of Mazon creek by specimens N. 203. To the characters marked in the description of the Penn: report add: that veins & veinlets though sometimes inflated at base (it is rather the space between them that is inflated) are little the medial nerve very thin, distinctly seen or seen with difficulty posthing thrice; undulate or apparently running into each others like those of a Dictyopteris. This last character is not yet ascertained. The branches or pinnæ have a comparatively very thick regularly 5 striated rachis. Better specimens are desirable though the species is certain. (22.6.71). Part A to Odontopteris.

D 2 Neuropteris Clarkson Lsqx. See corrected description of it in Penn: Geol. Rep! I. p. 857. The species is represented from Mazon creek by specimens in nodules: N. 233, N. 136, N. 202, N. 200, N. 199 and for its cyclopteroid leaflets by Sp. N. 208. Perhaps Cy 45, Cy 44, Cy 126 and Cy 36 which represent Cyclopteris oblqua Bryt. may belong to this species? I doubt of it on account of the undulate borders of this last species in our specimens and also on account of the rounded outline (23.6.71). Nevertheless N. 200 evidently belonging to this species has undulat border and the same appearence as those Cyclopteroid leaflets above marked. I refer also to this species with some doubt N. 209 & N. 210. (see 26).

D. 3. Neuropteris rarinervis, Bunt. The flat double veinlets which I have mentioned in W. Geol. Rep! vol. 2. as characteristic of this species are generally evidently seen or perceivable upon the large cyclopteroid leaflets but rarely so upon the small leaflets of the multiple pinnæ. The specimens of the nodules as N. 217 & 219 do not show this dedoubling of the veinlets but on the contrary they are there destroyed and replaced on both sides of the specimen by deep furrows or grooves marking distinctly the place and division of the veins & veinlets. By searching for them however they are found sometimes. I have still to reexamine a number of specimens upon shale to see if that cyclopteroid & neuropteroid specimen represent a single species.

4 Neuropteris Scheuchzeri Lsqx. at last as far as it is represented in the nodule specimen N. 226. appear to be merely a var of N. rarinervis. The nervation is the same though the lowest pair of veins is forked thrice and the veins are flat & double. The form of the pinnules is about the same. This species therefore if it is not delenda is certainly dubia. Uncasperid specimens Mathopteris N. 26 Lesq. p. 291 c.

D 2b. Neuropteris Clarkson Lsqx. Corrected description: Frond irregularly, bipinnately & andromedoid pinnules simple, broadly lanceolate above, shortly pointed, cordate or irregularly auriculate and hastate at the base by the inferior lobes becoming more or less elongated. Terminal pinnule lanceolate the upper part obtusely pointed, equally deeply and obtusely lobed on both sides, in the middle a medial vein thick or marked by a broad depression ascending to the point. veins dichotomous, forking three to five times in curving to the borders, strongly marked and distinct &c: marks detach as in Penn: specimens. The flat depression of the medial nerve is often markedly a thin threadlike groove in the middle like vein: terminating according to the size of the leaflets the number of the veinlets along the borders vary from 52 to 80 even 92 per inch. The cyclopteroid leaflets have 52 veinlets per inch at the border. 28/6. 71. Remark on the locality or geol station of the species that I have a good specimen of it on N. 31 a from Wilson run mines low coal. Remark also that the veinlets especially the ultimate divisions which are long are generally flexuous or slightly undulat and per place running into each others. Rem. that this species has not besides leaflets under the large ones (see 388 (13).

D 5. Neuropteris Germari Lsqx. Cyclopteris, Adiantites Goepp! see Sch imper Veget. Val. p. 426. Schimper remarks on this species that it is not satisfactorily known. I have published it in Penn: Geol. Rep! p. 856 pl 5 fig 7. the figure of a specimen which show the peculiar mode of laceration of the leaflets and which therefore confirm the species as described by Germar Kaulfuss first and by Göppert hereafter. From Mazon creek we have another specimen by Mc which is still more remarkable and more puzzling. It represents a branch of Aphlebia (Pachypteris) hirsuta Lsqx Penn: rep! bearing on one side of its pinnately or dichotomously divided rachis a branch of Aphlebia and on the other side a slightly lacerated pinnule of Cyclopteris Germari well characterized by its deeply marked veins & veinlets remarkably broad flat, 5 times dichotomous and by its disposition to lacerate and divide at the borders. The laciniæ are not quite seen they being apparently buried in the stone. This may be one of those case of superposition of two organs or parts of different plants as they are often remarked in the shale of the coal. But it is quite remarkable, curious to see from the figures of Kaulfuss the laceration of the leaves repeated in Penn: specimens apt to see the same kind of leaves of a peculiar neuropteris attached to a stem whose branches are lacerated just in the same way as are the leaves figured by Kaulfuss & by myself. It is certain any how that Adiantites Germari is a good species as we can have them from fragment in the Carboniferous formations. 24-7-71. See note in catalogue of Hoyt's specimen (1874) I. 21. which is a new and good specimen of this species. In Different from Neuropteris inflata also a good species. I have figured another specimen from Wilkinson

D1 N. obscura Ang. I have recently Sept 76 obtained many specimens from the tumulous of Thay Mt below Tremont. The species has by the form of it pinnæ and leaflets the same character as N. tenuifolia, Nyl. differing mainly by the large size of the leaflet and pinnæ which however are sometimes as small even smaller than in N. tenuifolia, by the scarcely prolonged or auricled base of the leaflets and which are generally enlarged toward the top, by the very obscure or rather total obliteration of the veins from the major furrow, and the direct (straight) not arched of the veins as apparent wherever they may be discernably. The terminal leaflet is lanceolate obtuse or rounded as in N. tenuifolia. The lateral ones vary from 4 to 25 millim long and from 3 to 10 mill broad. The upper leaflets are decurrent as in N. tenuifolia Nyl. The substance of the leaflet is thin but, rather coriaceous the surface (upper) sometimes polished, the leaflets often pedunculat or with their base somewhat elongated

D2 N. undans Ang. Ma 118 from Carnello is a very fine specimen referable to this species with the form of my fig. 216 of the Penn. Repos be turned or on side from a broad point of attachement, but entire nearly undulate, nine cent broad and only 5/4 cent high from the point of attachement to the top. — The nervation is straight not curved very thin but distinct with the glass.

D3 Neuropteris (Cyclopteris) plicata St Found in Lacoe coll. N 2249. X 439 which I think are referable to this species. The bases are variable some long oval-lanceolate obtuse like those of N. heterophylla but with border undulate the nervation less distinct and without trace of hairs, others large broadly oval obtuse cordate at base with the surface wrinkled and the border undulate other still nearly round still more wrinkled on the surface, of all these leaves the veins are scarcely distinct to the naked eyes. Though the substance is thin, it is slightly polished — This may be still a variety of N. heterophylla for the leaves oval lanceolate I see distinct trace of hairs even some deeply marked Therefore I leave this all with N. heterophylla. — 3a [illegible] in Lacoe coll. N 1547 [illegible] for different species in Lacoe coll. referable to N. heterophylla it is in specimens with [illegible] obtuse, cordate at base with [illegible] border nearly parallel to border I cent long 1 cent broad near the base with border nearly parallel to it near the middle nerves less marked distant veins distinct and distinct. [illegible] 10 per cent at the borders with smooth surface and no trace of hairs (see section 6)

D4 Neuropteris Loschii Brgt. Now in this that the surface of the leaflet is not always polished. Usually they must vary in size according to the size of the pinnæ as 40 cent long 2 cent broad in the pinnules 16 millimetres long and 8 to 9 mill broad.

D5 Neuropteris inflata L. Lacoe 542 is like the fig 4 of Pl. 7. The terminal leaflets of the pinnæ black + are oval lanceolate from figured on below [illegible] the lateral leaflets

D6 [illegible] Neuropteris [illegible] I have [illegible] a new species [illegible] perhaps [illegible] N. inflata. [illegible] Cyclopteris [illegible] The plants [illegible]

Number of
men at the beaches 35 per centimeter

3874. 1. Neuropteris coriacea Dawson. Of this species I have obtained from Mr G. S. Armstrong of Morris and from the Nodules of Mayo creek a fine specimen which is mine, the thick fruiting epidermis being nearly a counterpart of the one figured here. The pinnules, which are alternate (not opposite as said in description) show near the base of the pinna a tendency to become lobate at base. They turn upwards and the well marked nervation is as indicated in the figure, the veins at first straight up at a narrow angle from the thick medial nerve then curving to the border, the lowest pair branching or forking twice, the middle ones forking once with the bare reinlet simple and the upper forking again, the upper veins forking only once. Though these veins are well marked they are not broad and double as in N. racinervis Daws. The leaflets also have a far different form. This specimen indicates that the one figured in this report represent indeed a fruiting pinna. (1.6.71). I am not yet quite certain of this. The museum has besides the specimen above mentioned three specimens. N. 220, N. 221, N. 228 ~~Syntype of 229~~ all indicate a thick epidermis or thick leaflets, these being deeply marked into the counterpart of the nodule. The veins and reinlets being broad and deep, the intervening space is, per place inflated, forming the appearence marked upon my figure of N. 8. It is only when the epidermis is destroyed by maceration that the veins & reinlets are seen in their form as simple and filiform. It is evidently a good species. The nervation is as indicated above. (23.6.71.).

2. Neuropteris Dawsoni Dgn. Frond apparently very large and much divided, at least tripinnate, pari~ a thick, flat, smooth, equally narrowly ~~striate~~ rather pinnæ long linear lanceolate, distant horizontal or turned upwards, separated generally each by two nearly opposite ~~pinnules~~ pinnules of various form ~~pinnules~~ lanceolate, from an elarged round lobed base obtusely pointed or undulate lobed or merely undulate or entire on the borders, distant from each other becoming approached and ~~crowded~~ confluent at the top, forming a compound lanceolate equally round lobed and pointed terminal leaflet. Leaflets of the rachis lanceolate divided at the base in two opposite ~~leaflets~~ oval leaflets or merely lobed and equally undulate to the point. Lateroid leaflets very variable in their form generally cordate or cut at the narrow base, enlarging upwards irregularly lobed or cut on one side, entire on the other, diversely cut lobed and dentate at the top with veins distinct pinnate, flexuous slightly curved. In the leaflets of the ~~base~~ pinnæ, the medial nerve is deep marked nearly to the top and the veins ascending from it are thin flexuous well marked, scarcely arched forking twice. The species is extremely polymorphous. The bases appear of a thick texture have the surface generally polished and are therefore easily recognized though often found detached from the pinnæ. Fig 4, of the U. S. flora is well made and quite correct. It is also represented pl 20 figs 5, 6, 7 & 8 of the Penn. report. The large stems appear sometimes as having grown in water both as ~~stems~~ fistulose and bearing various lobed & dissected leaflets resembling some ~~stems~~ of Aphlebia. A proof more that Aphlebia is a fern. (10.7.71.) see Penn. rep. P. P. 20 fig 5.

3. Neuropteris coriacea var. ~~Neuropteris coriacea~~ intermediate between N. racinervis and N. Dawsoni. From the fragments obtained all from Mayo creek, it is ~~the~~ the male fruit bipinnate at least its upper part. pinnæ short, linear lanceolate or nearly linear obtusely pointed, alternate rachis winged in the middle by a depression or channeled. leaflets alternate, thick, bearing a deep impression upon the stone and evidently coriaceous, lanceolate, obtusely pointed in the upper pinnæ the upper ~~pinnules~~ leaflets ovate, cordate at base, entire, in the lowest leaflets round lobed at once as seen in the figure of this report. In the small pinnæ N. 221. the upper leaflets become confluent forming a broad obtuse lobed terminal pinnule. Medial nerve strong deep, ascending to the top of the leaf, veins forking once or twice according to the size of the leaflets, more arched than in N. Dawsoni, much inflated in the form which appears fructified, broad and deeply marked impressions which like N. 264 do not appear to bear fructification. In this specimen the thick leaflets have the border undulate. Terminal leaflet proportionately large, lateroid undulate on one side with a large obtuse lobe on the other, obtusely pointed. The form of the terminal pinnule distinguishes it from both N. racinervis & N. Dawsoni see above 1. where some of the characters of this species are indicated. 11.7.71. The nervation is as indicated in. A better figure showing nervation should be made. One specimen recently obtained from Mr Strong N. 478 shows more distinctly the characters of this species. The leaflets are often lobed or divided upon the top of the pinna and by the depression of the deep leaflets upon the rachis of the leaflets these borders become crenulate (3.10.71).

think, demonstrates that all the leaflets represented in our plate viii, fig. 1 to 6, belong to the same species. The cyclopteroidal leaflets of this species vary in size from little more than half an inch to four or five inches in diameter.

Neuropteris inflata, Lesqx.

Geol. Rep. of Ill., vol. ii, p. 431, Pl. xxxvii, fig. 2.

Though a few specimens of this species have been found in the concretions of Mazon creek since its description was made, these specimens do not indicate in the nature and characters of this plant anything more than was formerly known. All these specimens have only two basilar? round inflated leaflets, of a thick coriaceous substance, without any traces of lateral branches. One of the specimens has the leaflet of one side lacerated, or cut in lanceolate linear laciniæ, much like the leaves published in the Geol. Report of Penna., p. 856, Pl. v, fig. 5, as *Cyclopteris Germari*, Gopp? As the specimen which I considered then (1854, Bost. Soc. of N. H.) as referable to Goppert's species, is not in my possession, I cannot, by comparison, ascertain if it is or is not identical with ours. Moreover, as both the European and the American species are founded on mere fragments of specimens, we must consider the species which they represent as still uncertain or doubtful.

Neuropteris coriacea, Sp. nov.

Pl. viii, fig. 7 and 8.

We have of this species only a small branch in a concretion from Mazon creek. It is part of a secondary pinna, lanceolate in outline, bearing nearly opposite oblong lanceolate obtusely pointed pinnules, turned upwards at an acute angle to the rachis, and gradually diminishing in size to the terminal leaflet, which appears proportionally broad. As it is broken from the middle upwards, its form is unknown. The texture of the leaflets is thick, and the smooth epidermis is inflated along the veins and veinlets in an irregular manner, as seen in fig. 8, enlarged.

This inflation may be caused by groups of spores or elongated sori, placed along the veins which are twice forked, and along their divisions. A swelling

388 b. 16 g.
388 c. 1.

of this kind on the veinlets of *Neuropteris cordata*, Brgt., and which is also often remarked on specimens of our *N. hirsuta*, has been considered by European authors as representing organs of fructification. As the form and thickness of the inflation is very irregular, it may be caused on both species by some casual influence in the process of mineralization. The basilar leaflets of this species show a tendency to be divided into lobes and pinnules, having thus the same form as some of those of *Neuropteris Desorii*, Lesqx., to which this species is related, and from which it differs only by the thick epidermis, and by the more distant ramification of the veinlets. The small fragment mentioned in vol. ii of this Report, p. 430, as possibly belonging to *N. Desorii*, Lesqx., is referable to this species.

Genus DICTYOPTERIS, Gutbier.

Aldr. u Verst., p. 62.

Frond at least tripinnate, pinnæ linear-lanceolate, bearing alternate leaflets much variable in size, ovate-oblong obtuse squarely cut at the base, with equal lobes on both sides, or with the lower lobes slightly elongated. Medial nerve none, or merely basilar; veinlets anastomosing from the base, arched towards the borders, but irregularly undulating in ascending, and forming by their contact an oval-polygonal reticulation.

Dictyopteris rubella, Sp. nov.

Pl. vii, fig. 2 to 6.

Frond bi or tripinnate; pinnæ linear-lanceolate, with alternate oblong or oval-lanceolate leaflets, attached to the rachis by a broad pedicel. The inferior basilar lobes, as is generally the case in the species of the genus *Neuropteris*, are slightly longer or protracted into a little obtuse auricle. The terminal leaflet, somewhat broader and longer, is oval in outline, obtuse, and cut on one side into a short obtuse lobe, fig. 2. The leaflets of the large inferior pinnæ are more distant, larger, truncate at the base, slightly scythe-shaped outwards; and

1. Neuropteris Eversii Lsqx. Ill. Geol. rep.t vol 2. p. 430. Pl. 36 fig 4. The description and figure of this species are right. Specimen destroyed by fire at Penn. Never seen but once. See 388.1

+2 Neuropteris pachyderma Lsqx. Ill. Geol. Rep.t vol 2 p. 430 Pl. 36 fig 5. Same remark as for the former species.

+3 Neuropteris inflata Lsqx. Ill. Geol. Rep.t vol 2 p. 431 Pl. 37 fig 2. may be the same species as N. Collinsii Lsqx. see my note this vol. p. 382 – 1.

+4 Neuropteris flexuosa Brgt. Species as yet uncertain. I do not know it to be American. at least I do not know if any other species is referable to it.

+5 Neuropteris rotundiloba Brgt. The leaflets referred to it appear to belong to my Neuropteris capitata Lsqx see this vol. p. 383 b – 2.

+6 Neuropteris plicata Penn. may be a Neuropteris Spec. nova, described this vol. 3, p. 338 b no 11 p. 384 b.

+7 Neuropteris Villersii Brgt. as described and figured Penn.a report p. 858 Pl. 3 fig 3. Schimper in his Tat. veg. p. 446 considers this species of Brgt. as representing the upper part of a pinna of Neuropteris auriculata Brg. But the Neuropteris has not as yet been discovered in our Carboniferous formation and we have 2 specimens N. 6. figured in the Penn. report loc. cit. & N. 60. which both for the direction of the veinlets agree well enough with Brongniart's description and figure of N. Villersii. Brgt. says: nervulis numerosis, dichotomis arcuatis. while in our specimen the veins & veinlets are not very numerous forking only three or four times in a leaflet 1/4 inch long and they are not arcuate but straight. Schimper's description of Neuropteris auriculata indicate the same reference. Our specimens are apparently referable to Neuropteris callosa Lsqx (mss.) which should be described perhaps as an Odontopteris. but for its cyclopteroid leaflets.

+8 Neuropteris heterophylla Brgt. I do not think that this species is represented in our coal measures. At least I have not a single specimen which could be referable to it with certainty. Most of what I considered as belonging to this species is of Neuropteris Desorii Lsqx. One single specimen of ours N. 117 which I consider as representing the upper part of a penna of N. tenuifolia a or Lsqx. [illegible] might be referred to this species rather from the description of Schimper which consider it as the same as N. tenuifolia Brgt. The specimen represent the upper part of a pinna the one of U. S. T. Pl. pl 3 fig 3 N. Loshii. But the terminal leaflet of the pinna is not seen. Brongniart's Pl. 71 fig B is about 1/2 size. The veins & veinlets are very thin but more distinct and distant than in N. Loshii and therefore belongs to N. tenuifolia Brgt. This tends to prove that Schimper is right in considering both species as identical. One N. Desorii which in the beginning of my researches I considered as the N. heterophylla is a totally different. 13. 7. 71.

9 Neuropteris spec. nova. Specimen N. 80. Perhaps the fruiting branch of a Neuropteris. It is the top of a small penna with four lateral leaflets on each side and a terminal leaflet broken at the middle. Leaflets narrow scarcely more than one eight of an inch about 3/40 of an inch long, turned upwards or nearly erect, linear tapering to an obtuse or truncate points. rounded at the base in the uppermost pair, prolonged lower and the rachis into a round auricle attached to the round ovate narrow rachis by a slight pedicel which scarce upwards to a thick medial nerve which ascends to 2/3 of the leaflets. Veins and veinlets very strongly marked though thin, therefore very prominent and distinct more than in any other Neuropteris at least five times dichotomously branching to the borders where 10 veinlets are easily counted for 1/2 of an inch. this would give 20 to the inch proving how remarkably distinct they are. They are at first ascending along the medial nerve and then moderately curved to the borders. This species represented by this small pinna is especially remarkable by its strong though thin veins & veinlets its narrow rachis the round pedicel of the leaflets continued prominent into a strong medial nerve. If it is not the fruiting part of some known species of Neuropteris, it is a fine well marked species. Its small leaflets are in their form like a miniature of N. Loshii but with proportionally longer leaflet. 13. 7. 71.

10 Neuropteris sp. nova? N. 82. Top of a penna with a broad undulate, deeply striate rachis bearing on each side about 5 lanceolate or linear lanceolate leaflets large leaflets about 1 1/2 inches long curved or curved upwards with only two round leaflets at their base as in Neuropteris auriculata. The pedicel of the leaflets is broad and passes into a broad depression marked in the middle by a narrow threadlike filament. Veins dichotomous about 5 time divided arches thin but strongly marked and distinct, measuring at the borders 10 to per inch. Surface of the leaflets marked with prominent sharpish blunt hairs. Basilar leaflets round with veins and veinlets flabellate and dichotomous emerging from the base and straight. This specimen

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may represent the upper part of a pinna of Odontopteris Wortheni or of Neuropteris decipiens? (in nov.) Neither the leaflets nor the part between them is inflated and the veins are marked like the veinlets as prominent upon the surface and not by hollow tracts. The broad decurrent rachis is not like any of those of species of Neuropteris known to me but the venation is exactly Neuropteroid. It is placed with Odontopteris Wortheni till better specimens are obtained 13.7.71.

1. Neuropteris levis Lsqx. Could be compared with N. crenulata Brgt for the venation but certainly distinct by the pedicel of the leaflets the narrow rachis &c see above 388b c.

2 Neuropteris (sp. nov.) Lsqx. Penn. Rep.t P. X57 pl. 3 fig. 2. referable perhaps to N. lanceolata this rep.t p. 381b 1. The specimen is not in my hand. Rogers had it and can not compare. Such a species from a single specimen is obscure. Doubtful.

3 Neuropteris Loshi Brgt. The only specimen from which is referable to this species and which I consider as Brongniart's species fig. Lor. p. 229 Pl. 63 fig. 3 is on a large shale 5511 and were three small separate leaflets N. 276 are seen at different places detached from the rachis. The emptied one is ovate rounded much smaller than Brongniart's figure but exactly of the same form. The veinlets many times dichotomous are thin and somewhat inflated and distinct. The surface of the leaflets is minutely areolate and trace of a pedicel is marked at the base of the leaflets. Nothing is known of this species except what Schlotheim has published as indicated by Brgt as Filicites acuminatus Schl. Nachtr. zur Petref. p. 412 Tab 16 fig 4. from this figure the veins appear close but distinct. He does not describe them. Apparently a very rare plant. Schlotheim mentions that the specimen of his is the only one found with leaflets attached to the rachis 15.7.71.

4. Neuropteris delicatula Lsqx. Penn. Rep.t P. fig. 868. XX fig 2. Like superficially Odontopteris Lsq. Cat. p. 463. Can it be any connection? Can Neuropteris Lesquereuxiana be separated from Neuropteris fimbriata as it is figured in U.S.R. pl. 7. 15 fig. 1. Of course before the relation between this and the Odontopteris leaflets of N. fimbriata was ascertained, I could but consider it as a peculiar species. (15.7.71.) I believe it to be made of two species 2 of N. fimbriata 2a of Neuropteris tenuifolia.

5? Neuropteris gibbosa Lsqx. Penn. Rep.t P. X58 pl. 5 fig. 3. may be referable to N. plicata Hein or N. obscura sp. nov. Lsqx. Specimen is not in hand. Compare.

6. N. minor Lsqx. Penn. Rep.t P. 364 may be N. rarinervis, at least it looks so from the figure and from the description P. 359.

7 Neuropteris adjuncta Lsqx. Penn. Rep.t P. 860 pl. XX fig. 1. Looks as an Odontopteris Specimen not in my hands. Compare if possible or if you

8 Neuropteris unguiculata Brgt. The specimens so called which agree with Brongniart's description of this species Foss. t. p. 231 Pl. 64 fig 3 & 4 though exactly corresponding in form to those of the French author belong to Neuropteris Clarkson i nov. sp. see

9 Neuropteris microphylla Brgt. is uncertain. It is Vault or Mayo creek specimens which are not distinct enough. It may be either N. minor or N. rarinervis Bunb.

10 Neuropteris? sp. nov.? Spec. O 22 & 23. A remarkable form. The upper part of a bipinnate pinna or frond. Primary pinnæ alternate short linear lanceolate pointed? Divisions round-oval very obtuse the inferior ones distinct though imbricate at base, sessile by a broad base, truncate at base, the superior ones becoming confluent and decurrent on the rachis, smaller with an apparently small terminal pinnule. Upper leaflet with the veins coming out from the rachis distinct more, thinner veins 5 with two medials from a broad base and without medial nerve. The same specimen has on the reverse O 23 a segment of a pinna whose upper leaflet are those of Odontopteris Jamesoni with some small sphenopteroid leaflets on one side and a large lanceolate Neuropteroid leaflet on the other. The specimen which has some of the parts of pinnæ with opposite oblong leaflets larger than those of the rachis may represent N. rotundifolia Lsqx. If it is the case N. Neuropteris capitata can not be considered as the same. 15.7.71.

11 Neuropteris? sp. nov.? Specimen O 27. Also a simple pinna lanceolate taper pointed or pointed bearing 11 pairs of leaflets. Leaflets proportionately long, linear equal or oblong obtuse, connecting in form those of Neuropteris Lesquereuxiana. Leaflet over to each other, imbricate on the wider lanceolate rachis attached by a broad base, sessile, or set on the upper side. The venation of the two lower pairs of leaflets is Neuropteroid and regular with the medial nerve marked to the middle and the veins distinct. Those dichotomous distinct like the veinlets not much curved. much like those of

Smaller

Smaller

Neuropteris tenuifolia. From this upward the nervation is quite apparent, the veins reticulate, inflated, prejudice with the surface of the leaflets irregularly rough and corrugated. The terminal leaflet not seen in this specimen, it appears very small as in Neuropteris and, tapers downward to obcordate adnate basal leaflets which are decurrent, [illegible] maybe Kuracea??

12 Neuropteris articulata? John. Specimen N. 493 from Tollsville (Kinney) is apparently referable to this species. The pinnae are exactly rectangular in form, united at least a part of their length, the terminal leaflet is long, narrow, and tapering, the nervation is visible, the veins being conspicuous. It may be from deformation of N. Loshensis. The specimen is too small and obscure for conclusion. see p. 467 c. 1 rather Neuropteris sp. from Upper Clear Creek = W. Obscura.

13 Neuropteris Clarkiana Lesq. Some pinnae are linear with oblique oblong obtusely pointed or obtuse leaflets like those of N. vermicularis etc. Spec. No. 1615 from Mayo Creek. The leaflets are however generally enlarged at the lower basal side and the nervation is strong and distant. The terminal leaflet is also characteristic like fig. 1 of my plate U.S. flora. see supra p. 467

14 Neuropteris undans Lesq. Specimen No. 1616 from Mayo Creek, given by Mrs. Fisher closely the character of this species as described in the Penn. Report. as N. tenuinervis which I suppose might be the same. It is a large leaflet ovate obtuse, 6½ cent broad obtusely long, 3½ cent broad at the base with deeply undulate border, a narrow midrib, distinct to the point and three lateral veins, emerging at the base from an enlarged base and above from the thin midrib. The veins are distant but not inflated, distinct with the glass only. see supra p. 386 c. 2 — see

15 Neuropteris pachyderma Ill. Rep. II p. 430 Pl. 36 fig. 5. — I have of this species a fine specimen No. 1618 received from Irons. It represents a whole pinna 13 cent long, lanceolate or gradually tapering to a compound lanceolate obtuse pinnule obtusely lobate on each side. Lower pinnules oval obtuse 16 to 18 and millim long, 10 to 11 millim broad, truncate or cordate at the base slightly oblique to the rachis to which they are attached either by their whole base (truncate) or by the middle forming an enlarged pedicell as it is marked in my figure of the Ill. Report. vol. II. These leaflets are very thick, inflated without any trace of nervation, except in one or two of the leaflets which appears as obscurely marked with very thin veins cutting through the thick epidermis parallel at the base for this once or twice. This is therefore a true Odontopteris. In the lower pinnules which are cordate and attached to the rachis by the enlarged midrib, the lateral veins appear to come out of the midrib and to incline in slightly curving toward the border. These concave borders are surrounded by a flat narrow entire ring, all the rounded leaflets except those of the two upper pairs are separated to the base

16 Odontopteris aequalis. Ill. Rep. III p. 434 Pl. 36 fig. 2. is represented by a fragment of Nodule No. 1619 and 1619 a. the middle part of a pinna of which three pairs of pinnules only are preserved on each side. These are oblong equal, very obtuse slightly decurrent and joined above the rachis by a narrow obtuse sinus attached by their whole base to the narrow rachis from which come out the veins both branching nearly parallel, slightly diverging from the middle toward the borders once near the base and once toward the point. The leaflets are inflated as in the former species but the veins distinct, the border around the leaflets are also flattened just as in O. pachyderma. I believe therefore that both these forms represent the same species as in the upper part of No. 1618 the leaflets are also joined to the rachis by their whole base, connected above. The rachis are with narrow obtuse sinuses. To this should also be referred No. 1620 and 1620 a where leaflets are broader and longer, attached by an enlarged middle with the middle veins more pronounced.

See 389 c. (3) & Supra 467 c.

1. Odontopteris ~~subcrenulata~~. Sp. nov. Ma. 12. Pinnæ lanceolate shortly decurrent, linear obtuse, short, the lowest ones about 3 cent long, ~~gradually~~ ~~decreasing~~ pinnately deeply lobed, gradually shortening upwards and passing up into simple terminal pinnule. Pinnules short obtuse or rounded nearly quadrangular in outline evidently but minutely crenulate at the top. Veins either from dividing of the middle nerve a little above the base forking once or twice, ~~but~~ understood and not covered by the epidermis, close and more numerous than in O. Schlotheimii to which this species resembles. It differs also by the shorter secondary pinnæ and the shorter nearly square lobes or pinnules. It has also some likeness to O. crenulata, ~~but the pinnæ are not formed at the base, but decurrent and not enlarged on the lower side at base~~ as in the O. crenulata. The substance of the leaves is also thicker. This species is somewhat like O. Böhmii Gutb. but the leaflets are much larger in the American specimens and ~~crenulate~~ serrate. (1) It may be after all a mere var of O. Schlotheimii with the end of the veins passing up and slightly above the border of the leaflets. All the characters of form and nervation are the same. The comparison of better specimens may decide what it is. see 390 b (6d)) Catherine to

(1) There is no relation to O. Böhmii Gutb.

2. Odontopteris Brardii, Brgt. A number of specimens (as 7 to 8 in my Catalogue p. 56 represent this species, it seems though they are mere fragments of pinnæ four to 6 cent long, fragmentary and only 1 ½ cent broad or less. The leaflets have about the same form as those figured in Bronniart, that is they are oblong obtuse, or slightly pointed and scarcely falcate toward the point, ~~which~~ by their whole base, either joined near the rachis or slightly decurring along the rachis before their connection at base. They are comparatively broader and shorter than in the European specimens, averaging five to 8 millimeters broad toward the base and 8 to 9 millim. long. The middle nerve is more or less distinctly marked though the secondary veins which are extremely thin and close mostly come up from the rachis ~~though~~ the upper ones are evidently from the middle ~~to~~ nerve which they are in an acute angle of divergence and straight to the borders. This character, the extremely thin veins, the shorter broader leaflets obtuse or obtusely pointed are indeed differences marked enough from the European species. These pinnæ rather represent Odontopteris alata Gp., the more so that one of them has the terminal leaflet preserved. It being long, 3 ½ cent, enlarged above the base and then gradually narrowed into a long acumen of the same character as in ~~Od.~~ alata. Of my Cat of Colt Hill, but still with a longer narrower acumen. This differs from my description by the veins which are not distinctly marked but on raised above very thin and close somewhat indistinct. ~~From the I cannot find~~ This should be referable however to O. alata. rather than to O. Brardii of Brgt

3 (From 389 d) This specimen 1620 has the leaflets broader shorter, ~~alternate~~ separated but with a border imbricating 1 ½ centimeter long and some as broad as long. They are rather upwards and undulate at the base with the same nervation as in Odontopteris ~~Neuropteris~~ Crenulata as figured in my Plat of the U. S. flora. This is referable to Neuropteris crenulata like spec 1621.

see not on Odontopteris & Neuropteris pachyderrata

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the axillar pinnules, still larger and cyclopteroidal in form, are attached around the stem by a half circular notch, nearly surrounded by two broad auricles. The veins, anastomosing from the base without medial nerve and in their undulations forming oval-polygonal elongated meshes, curve towards the borders, where the last divisions end in arched close lines.

In this species, found in soft shales at Murphysborough, the epidermis or substance of the leaflets has become, by maceration, separable from the stone, and is easily obtained in lamellæ. Whole pinnules can be got in that way without any earthy substance adhering to them; and in that semi-opaque state their texture and nervation are easily studied with the glass. The veins present, under the microscope, the appearance marked in fig. 2.

When the 2d vol. of this Report was published, no species of this genus had been found in Illinois. Now this new one, obtained in numerous and well preserved specimens, not only adds a beautiful species to the flora of the Coal Measures, but furnishes us new evidence on some questions concerning the vegetation of plants of this kind. First, our specimens prove, beyond doubt, the close relation of this genus with the former. The form of the fronds, of the pinnaæ, of the leaflets, and their variety in size and shape, are exactly alike in both genera. Truly but for its nervation, we should have in our new *Dictyopteris* a *Neuropteris* scarcely distinguishable from *Neuropteris Loschii*, or *Neuropteris tenuifolia*. But further, the peculiar nervation, as well as the peculiar reddish color of the plant in its fossil state, permit us to identify the large leaflets of the species of this genus with the small ones, or afford the proof that for *Dictyopteris* as for *Neuropteris*, the large round cyclopteroidal pinnules, always found isolated, really belong to species represented by pinnæ bearing small leaflets of a widely different form. It would not certainly be possible to admit specific identity between the leaves represented, pl. vii, fig. 2, and those of fig. 5, without those peculiarities of structure remarked in both.

The species of *Dictyopteris* are rare in the Coal Measures. In the United States none had as yet been found but *D. obliqua*, Bunb., whose remains are very abundant at some places in Pennsylvania and Ohio, and which have also been found, but rarely, in Kentucky and Arkansas. By the form of its leaflets, its ramification f c. f, this last species is related to *Dictyopteris Brongnarti*, Gutb., the only species of this genus known in the Coal Measures of Europe. For *D. neuropteroides*, Gutb., described from a few small leaflets, is, according to Prof. Ellinghausen, a true *Neuropteris*, and *Dictyopteris cordata*, Roem., according to the remarks of the author himself, is a variety of *Neuropteris cordata*, Brgt., as his *D. Hoffmanni* seems to be a variety of *D. Brongnarti*, Gutb.

Genus ODONTOPTERIS, Brgt.

Ill. Geol. Report, vol. ii, p. 432.

Odontopteris subcuneata, Bunb.

Pl. viii, fig. 10 and 10b.

From the specimen figured here from Mazon creek, it is clear that the fern published under this name in the Ill. Geol. Report, vol. ii, p. 433, pl. xxxvi, fig. 3, does not belong to this species. It is referable to *Odontopteris heterophylla*, Lesqx., loc. cet., p. 433, pl. xxxviii, fig. 2 to 5. The pinnules of *Odontopteris subcuneata*, Bunb., are opposite, proportionally longer and narrower, slightly narrowed in the middle, and enlarged to the very obtuse point. The veins are closer to each other; and as the English author has figured them, they curve downward before coming into the border of the rachis, and descend in fascicules along the somewhat decurrent base of the leaflets. In their lower part and just above the decurrent border, these leaflets are all strongly bowed. The terminal pinnule is broken above the middle; it is proportionally large, and appears to be oval-obtuse, entire or without any lateral lobe. I owe this specimen, the most perfect known of this peculiar species, to the kindness of Mr. Michael Prendel, of Morris, Ill.

Odontopteris Bradleyi, Sp. nov.

Pl. viii, fig. 11.

Nothing is known of this species but the leaflet, which has been copied in our figure. It is lanceolate pointed, somewhat contracted at its base in a broad pedicel. The veins are closely approached, sharply and deeply marked, dichotomous in ascending, nearly straight from the base, where they become parallel. The veins and veinlets of this species are too close to each other and too numerous to admit it as related to *O. heterophylla*, Lesq., which has its leaflets sometimes pointed. It may be compared only to *Odontopteris acuminata*, Ll. and Hutt, of the Oolite.

In concretions from Mazon creek.

1 Odontopteris subcuneata Bunb. Specimen O. 25 & O 26. should perhaps be referred
To this species. The nervation appears similar. It is the case at least for O. 26. Which
differs from O 24. the specimen published and figured here, by shorter, proportionally broad
leaflets, enlarged above sometimes lobed or wound oval, generally obtuse, less strongly
bowed at the inferior base, there seems & sinuslets less distinct and the upper borders of
the leaflets more or less undulate-crenulate or simply lobed. In O. 26 also, the leaflets are
generally alternate, not opposite and the rachis is broader. The general look of the penna
is so different, the leaflets in O 24 being distant, equally oblique narrower near the
base while those of O 26. are closer, sometimes overlapping each others on the borders
A specimen O. 25 is evidently basing, the spaces being however rare, scattered, difficult
to see and the pinna or rather leaf divided on one side and entire on the other, it is
referable to O. Worthenii Dawson. (23.6.71). For O 26. see below 10.

2 Odontopteris squamosa Lesq. Penn. Rep. I. 860. pl XII fig 2 & 2c. Schimper. comp.
is probably the same as O. Brardi. We have of this last species a number of specimens from
Newport R. I. There is evidently a great difference in the form of the leaflet, more especially
in the nervation which is thinner closer and of a different character. I consider it as a good
species. The nervation is well marked in 01 and should be carefully figured by comparison.

3 Odontopteris Brardi Brgt. Two specimens O 18 & O 20 (O 16) appear referable to this species
if they do not belong to O. alata Lesq. I do not have the specimen of O. alata for comparison
but the leaflets are not as much separated from each other, proportionally broader & more
rounded showing some more resemblance to the European species as figured by Brongniart
The american specimens however have the point of the leaflets turned upwards and
not curved toward the point of the pinna and the leaflets towards the point are not
as much enlarged and have indeed a different appearance. 15.7.71 I consider my
Odontopteris alata a good species the next Schimpers thinks it probably the same as
O. Brardi. Indeed all these Odontopteris can pass from one to the other for example
specimen O 33 from Morris that has a pinna whose leaflets agree exactly
with those of O. Brardi Brgt or rather of O. alata Lesq. Schlotheim's Petrefact pl. 3
fig 6. has O. Schlotheimii Brgt with leaflet evidently severed from the middle like Newberry
We have such leaflets from Newport R. I. generally in connection with Odontopteris
Brardi or alata. Nevertheless we can not mix up species, for some detached
leaflets when even we do not know to which species they belong. I believe from
comparison of our specimens with Brongniart's figure & description that we have not
as yet O. Brardi but that all our specimens of Newport referred to this species
belong to O. alata. Compare the leaflets which are generally oblong and obtuse and
on the penna figure of my Catalogue the winged stems and the form the leaflets
have on the rachis with that of the inferior leaflets in Brgt figure 15.7.71 see 390.

4 Odontopteris Schlotheimii Brgt. Besides the splendid specimen figured in Bunb. Fossil
pl. 6 fig 1. (5) we have plenty of brothers specimens of this species from Newport. They
show diverse appearances of the plant. They are all of a reddish color and therefore
easily distinguishable. Among them there is one marked N. 231 which looks like a
Neuropteris but which demands comparison with better specimens. The characters of
O. Schlotheimii are indicated in Brongniart and in my report see p. 470 fig. 11. 5. fig. 81 & 6. 15.7.71
see also p. 390

5 Odontopteris crenulata Lesq. A small specimen O 40 with the character indicated by
Brongniart showing that the species is a good one. Schimper refers my O. intermedia to
O. Brardi, a mistake, I think. The nervation being broader more prominent in my species
and the point of the leaflets appearing slightly crenulate. It might be referable perhaps
to O. crenulata. As yet the species must be preserved. 15.7.71. see p 390 & 7.

6 Odontopteris intermedia Lesq. as above (5)

7 Odontopteris pinnata nova = crenulata L. 22. O small pinna with short, slightly
oblique linear entire pinna. Pinna cut into obtuse leaflets joined from
the middle or rather obtuse lobes crenulate at the point, veins thick, readily branching
all emerging from the secondary rachis. Specimen is bi-nerved. 15.7.71.

8 Odontopteris subcuneata Bunb. represented by O. 2 & O 20. as described p. 390.

9 Odontopteris Worthenii Lesq. O. 25. A specimen from Mazo Creek, representing
a single pinnule 6 to 7 lobed on one side while the other side is entire. The description
of fig. 2 in Geol Rep. Ill. vol. 2 p. 432. pl 36 fig 1 are right.

10 Odontopteris species nova. O. 3 & O 4 (O 5) Two specimens representing a pinna with a broad
smooth rachis merely that in the middle by the continuation of the veinlets descending to it

3491 c
pinna divided into alternate oval very obtuse leaflets sometimes enlarged
and obovate at the top. nervation very slightly decurrent to the rachis
membranate at base. medial vein stronger and dichotomous, secondary
veins twice or thrice dichotomous; lateral veins descending to the base of the leaflet
are less marked but also once or twice dichotomous. The species might be
referred to O. reticulata. But it differs much in the form of the leaflets
which are scarcely narrowed toward the base, proportionally shorter and broader, alternate
crowded, ovate, mucronate at the borders and by the nervation. It has not any
basal one but a far stronger nervation than that of O. Worthenii. 15.7.71
Dyo (Odontopteris) microphylla Dyd Ill. Geol rep vol 2 p. 433 N 38 Fig. 2-5 Des
-cription and figures right. The specimens are not as good as there on hand to make
the report. 15.7.71 See p 470 b 4
8 Odontopteris Schlotheimii Brt. We have two specimens 0.38 & 0.48 of this
species, from Morris which indicate fructification on the borders of the leaflets and
which therefor should be figured. 24.7.71.
3. Odontopteris alata Dyd. Remark upon one of my specimens, C 20. that the inferior
leaflet, is, near the top of the pinna attached upon the main rachis therefor rendering
the rachis winged and that in descending these inferior leaflets become attached to the
base of the secondary rachis as Schimper has remarked it. We should therefore consider
our species of O. alata as a var of O. Brardii 10.8.71. See p. 470 a 1.
4. Odontopteris deformata ¶ Specimen inedit. (name may be changed). See specimens
017 a. 0.57. Subpinnate. pinnae linear lanceolat, narrow, apparently long.
Spec: 0.57 has one about 1 foot long.) pinnate becoming merely pinnate at and
near the top; pinnae short, open near the base, oblique toward the upper part,
united to a proportionally broad rachis, short, less than three lines long, linear lanceolate
pinnules, joined merely near the base one, near the top where they become more and
more confluent. small & mall: long, linear, less than 2 lines at base, lanceolate, obtusely
pointed or oblong obtuse with the rachis nearly ninety to two parallel dichotomous
Upper leaflets or pinnules much broader and longer entire or slightly lobed oblong
obtuse terminal pinnule deltoid, obtusely lobed on one side, obtuse. The
figure is far different of any one as yet published having merely some distant likeness
to Odontopt. is figure of Dyd. In short pinnae becoming pinnules near the top of the long
narrow pinna with broad base entire toothed, the marginal veins do not give to this
species a particular appearance. 12.X.71. The large shale 057 has short basal pinnae
like O. Brardii & N. Agassizii
(4) name deformata given to Dyd.
5. Odontopteris Britannica Gutb. Mr. Southwell sends sketch of a small
branch of fruits exactly similar to what is published under that name
by Geinitz. See p 471 b 4
6 Odontopteris Dyd. see Mem. on Grand'Eury p. 4.
D7 Odontopteris reticulata Dyd. I refer to this species the specimen of Torrent
of Chestnut hill No 31. It represent a pinna 5 cent long broken
below its top. bearing on each side of a broad rachis 1½ millim. broad
5 pairs of alternate half round or broadly oblong very obtuse pinnules
slightly turned upwards attached to the rachis by a broad base,
slightly auricle at the lower part and also slightly decurrent at
the base of the point of attachement, crenelated all around. More
distinctly at the broadly rounded top. Middle nerve none, all
the veins emerging from the rachis distant, parallel, forking
once or twice: Other pinnules are about one centimeter wide at the enlarged
base and one cent. long. A smaller branch upon the same specimen
has leaflets longer and narrower, and the lowest elongated lanceolat
deeply dentate, exactly of the same form as those in Dyd. Pl 78
fig. 1. This specimen has to be figured. One of the leaflet has the veins
see p. 389 f. & supp. to Odontopteris p 470 a

1 Alethopteris onveni? Specimen Al 79; Al 20, Al 23. Al 26. represent a species with fructifications. The specimens are very poor. They merely represent parts of broken pinna where leaflets appear disconnected and rounded at base. The medial vein is strong, ascending to the point. the strong thick veinlets branch only once from near the base sometimes twice and are oblique on the medial nerve. The fructifying pinnules bear a single thick round sporange placed upon the middle or at the forks of each vein. The substance of the leaves is not as thick as in the other species. Though it appears quite distinct specifically, the specimens are not good enough for a satisfactory determination. It much resembles Al. obliqua Bgt. 28.7.71. See p. 394 c(2)

2 Alethopteris dimorpha Lsqx. See U.S. foss. fl. Vol. 2 & description. Though apparently a good species may be merely a var. of Pecopteris Knowltoni or P. lacinioto with which the species changed by metamorphism. Two of the specimens Al 25 & Al 25b represented by fig 1 & fig 5 are at the Museum the others belong to Amherst college.

3 Alethopteris Sheaferi Lsqx (Pecopteris). Cat. of U.S. fossil plants p11. pl 1 fig 4. Schimper Cat. Veg. p 562. describing this species as Alethopteris Sheaferi, remarks that it is very near to A. aquilina or rather identical with it. In reexamining the only specimen obtained of this species and comparing it with specimens of A. aquilina, I find at present a great difference: by the decurrent leaflets, distinctly undulate on the borders much shorter, somewhat narrowed in the middle and by the medial nerve which is not quite as broad. It is much like ? Alethopteris ligoides described above 291 b and might be the same except that the veinlets appear more distant and less oblique on the rachis. It should be compared again with better specimens (see mec. p. 396) 7.7.71 (Al 19 is the same as bella mecum Alethopteris sp. nov. ovalis?) fructifying. Bipinnate. pinna known a little more than one inch broad: leaflets free to the base, attached to the finely striated rachis by their whole base strong oval obtusely pointed or obtuse, short, not an inch long, 3/25 of an inch broad obliqua or turned upward. Fructifications marked by thick simple veins or veinlets perpendicular to the medial nerve, formed by a series of 6 to 7 small oval-elongated sporanges apparently placed on a line upon simple veinlets. A poor marker species which can not be compared to any other of the series. It shows little Al. Onveni? to above 1. that the form of Section do not have all their species with marginal fructifications. On other side of the shale has an Alethopteris sterile which appears to be the same species. Pinnae lanceolate with narrow rachis; pinnules, lanceolate obtuse enlarged, decurrent and joined together at the base, the medial vein thin, ascending to above the middle, veinlets simple forking ones. The specimen Al 37 is varnished, and the nervation is obsolete. But neither by its lanceolate obtusely pointed leaflets, nor by its nervation or rather fructification has this species an analogy with any other. 30.7.71. (see pinnae 392 b 7.7.71.

5 Alethopteris hymenophylloides Lsqx. this report. p 393. I refer with some doubt to this species a small specimen Al 102 from Newport. (see p. 392 c-1.

6 Alethopteris spinulosa Lsqx p. 396. Represented only by a small specimen from Newport Al 102. The veinlets are obsolete but it is apparently the species. 29.7.71. also Al 116?

7 Alethopteris obscura Lsqx see plate 6 U.S. foss. flora for description. Newport. 29.7.71. see 392 b.-5

8 Alethopteris aquilina Bgt. ? or Sp. nova. specimen Al 30. It resembles by the form of its secondary pinnae Alethopteris aquilina Bgt. But the pinnae are open or perpendicular to the rachis, rigid, the pinnules generally disconnected & the lowest shorter and broader, slightly sickle shaped and the lower inferior pinnule alone near the main rachis is broadly undulate lobed. The nervation is not quite distinct. the medial nerve is broad and the veins appear as forking once or twice. It is somewhat like Al. Grandini Brong? but still more different from it than from Al. Aquilina. 12.8.71. Al. 91 (Al 124) are separate perhaps to the same species.

9 Alethopteris Serlii Bgt. We have obtained from Al Strong and from Mazon creek two unmistakable specimens of this species. One is a pinna with leaflets more than two inches long with leaflets scarcely more than 2 centimeters long and 1/2 inch broad. The other is part of a compound bipinnately divided pinna, the two lower pairs of pinnae alternate pinnules, with the upper part simply pinnate. has very large pinnules as it is generally found. The description of this species is not unlike that of Al. crispifolia as figured by Bgt. only the leaflets are broader. It is the only specimen of this species obtained with this double division of the pinnae. 3.10.71. I have seen in no duke of Illinois creek (1876) pinna with pinnules 1/2 and an half centimeters long and 12 millimeters broad, while a pinnae of A. 392 of Lacue specimen has short, half round or broadly oval pinnules. I cut from 6 millimeters and the terminal one

A. crassinervia sent to Prof. Lesley.

391 6

Alethopteris vide Bry! Tabl des genres p. 15

D 1. Alethopteris lonchitica Bry! Veg: foss. pl 128. Specimen Al 97 from Mazon creek is exactly the species figured by Brongniart loc: cit. But it is peculiar that I can not find neither in Brongniart nor in Schimper a mention of this peculiar form referred by the name at the bottom of the plate to Alethopteris lonchitica. Is there a new variety in this species. Alethopteris Sternbergii Göppert Syst foss 295 as figured by Sternberg Fl. der Vorw. 2 p. 21 tab 33 fig 2 has some likeness to this variety or species; but the leaflets are shorter and less pointed. As much as can be seen by our specimen the nervation is like that of Al. lonchitica, simple and forked veins alternating, mostly two forked veins separated by one simple. 27.7.71. ~~Sept 364 L (14) Arcambigua.~~

D2. Alethopteris Serlii Bryt. We have in the museum a splendid specimen of this species Al 5. It is part of a penna with pinna curved downward and about 1 foot long.

D3 Alethopteris Pennsylvanica Bgt. Penn. Geol Rep! Bge 864 pl. 11 fig. 1 & 2. The description is about right as well as that of Schimper Pal. Veg: p. 562. Schimper says that it resembles Al. Grandini Bryt. But it is far different, the leaflets being proportionally shorter and broader and not narrowed in the middle. It may be a variety of Al. lonchitica but is not Grandini. 27.7.71. It must be noted that the veins and veinlets are more deeply and distinctly marked than in Al. aquilina Bgt. ~~Callipteridium~~ Indeed the midrib & strong nerve is stouter than in any other species.

D Alethopteris Owenii Bgt. Ann. Sc. Nat. Geol. Rep! 2 p. 309 tab 2 fig 1. See my description & figures which are correct except that it is not said that the veins and veinlets are oblique on the medial nerve or obliquely running to the borders as it is seen by the figure. Schimper compares it to Alethopteris lonchitica Sternb. a species of which I have a very sketch and which from its appear very different. 27.7.71.

D8 Alethopteris aquilina var Bryt = Ag. ambigua Specimens Al 32. are doubtfully referred to this species as a var. The rhachis is covered with separate linear pinna, three to four inches long with with oblong obtuse or obtusely pointed leaflets either joined or disconnected at base, mostly perpendicular to the rachis with an ovate terminal leaflet connected with the two upper leaflets of the pinna attached at its base. The texture of the pinnules is thick, forming at the surface a coaly pellicle which obscures totally the veins and veinlets. Medial nerve very broad ascending nearly to the point, the veins appear divided as in Al. aquilina Bgt. This species is abundant at Duquoin and other localities of Ill. and generally recognized by a flattened space encircling the borders. But as yet I am not quite certain that it is the same as the European one. The pinna and leaflets are shorter and narrower and the fructification is not mentioned by European authors. Adolphe Brongniart Veg foss. p. 286 says in comparing it with P. aquilina: "On ne peut pas douter que ces plantes ne fussent extrêmement voisines, car outre la grande analogie de formes, l'aspect des fronds très coriaces, à bords recourbés en dessous et nervure moyenne très marquée et d'un tissu qui paraît épais et coriace, indique encore une plant analogue avec Pteris de cette section." This form has sometimes as here pinnules as A. aquilina or A. Davreuxii the nervation however is always obsolete

D9 Al. thopteris Massiliensis Bgt. is considered as Owenii by Schimper, Pal. Veg. p. 561 comme une belle espèce. see for description Schimper loc. cit. Geol. Rep. Ill. vol. 2: p 438 Pl 40 fig. 1 to 4.

D7 Al. thopteris Conrana Bgt. In comparing my specimens of this species with the figures and obliterated with those of A. Grandini I find very little difference between these species. They may be the same, though in the former species, Al. Grandini the medial vein is thin scarcely marked, the leaflets undulated-lobed, scarcely connected at base while in Al. Owenii the leaflets are more entire connected and marked by a deep and often thick medial nerve. 27.7.71.

8. Alethopteris virgulata sp. nova. Bipinnate. Primary pinna widely ovate, secondary pinna alternate, oblique elongate with a broad straight rachis, leaflets linear narrow, obtuse or obtusely pointed disjointed to the rare, decurrent on the rachis, undulately lobed on the borders often narrowed in the middle, medial nerve well marked ascending nearly to the point, veinlets forking once, rarely one of the branches forking again, obsolete by the thick texture of the leaflets very oblique. The leaflets are inflated at their base on both sides of the medial nerve as if they were bearing agglomeration of sori or fruits of an ovoid inflated shape. The specimens Al. 34 & the most of the specimens from Mazon creek are obliterated and distorted by fire but it is easy to recognize the original forms from which the characters are drawn. The nearest relation to this species is Al. Grandini. 28.7.71.

Odontopteris Schlotheimii, Brgt.

Veg. foss., p. 256, pl. 78, fig. 5.

Rarely found in the concretions of Mazon creek, but abundant in the roof shales of the coal at Morris. The frond of this fern is very large, at least tripinnately divided; the alternate secondary pinnæ linear lanceolate, two inches long or more, and more or less deeply and regularly cut in alternate round, oblong lobes, or in oval-lanceolate obtusely pointed pinnules, varying from one-fourth to half an inch long. The veins and veinlets, with the disposition and divisions as marked in Brongniart's description, are thick, parallel, and generally forking once. In the large leaflets there is a medial depression looking like a medial nerve, the veins generally branching from a medial point. Though somewhat obscure, the specimens or this species at Morris are easily identified by the reddish-brown color of the epidermis.

Genus ALETHOPTERIS, Sternb.

This genus is admitted, for the disposition of the fronds and for their division, as it is characterized by Goppert in his Systema, p. 175, and for the position and the form of the fructifications, as modified by Geinitz, in his Verstein, p. 27. It therefore contains not only species whose fructifications are marginal and continuous, but species also bearing in some division of their veins, or between them, round or starlike groups of sporanges like those of the genur *Asterocarpus*, Gopp. As the fructification of some of our species is unknown, or is not clearly seen through the substance of the leaves, some are admitted into this genus from mere analogy in the divisions and in the form of their fronds, and in their nervation.

Alethopteris Mazoniana, Sp. nov.

Pl. ix, fig. 1 to 8, and Pl. xiii, fig. 5 and 6, fruiting.

Frond evidently large, many times pinnately? divided, dichotomous at the end of the divisions;# pinnæ long linear, tapering slightly toward the points, either pinnately or bi-pinnately lobed; lobes oblong entire obtuse, joined near the base and per-

Main rachis broadly rubbed in the middle & grooved marked throughout with narrow equal striæ.

dendicular to the rachis, or longer broader linear obtuse regularly undulate, lobed on the borders, and more or less distinct and distant to the base. Medial nerve thin, but deeply marked; veins of the simple pinnules rather curved upwards, forking once only at the middle; in the undulated lobed leaflets, one of the veins ascends to the sinus, and is twice forked upwards.

The divisions of the frond of this species appear to have been opposite to each other, and distant, at least in the upper part of the frond, as it is seen fig. 7, representing a specimen which at first seems to belong to another species. As the nervation, the broad deeply grooved rachis, and the form of the pinnules are the same, it is evident that it merely represents the upper part of a frond or of a pinna, whose ramification is either in the whole, as in the *Gleichenia* of our time, truly dichotomous, or pinnate and dichotomous, as in some of our species of *Pteris*. The fructifications of this species as represented pl. xiii, fig. 5 and 6, would rather refer it to the genus *Gleichenia* or even *Polypodium*, than to *Pteris*. They appear like round, oval, enlarged sori, placed along the borders on both sides of the leaflets, between the branches of the veins, as seen fig. 6 enlarged. The outline only of the fructifications is observable through the substance of the leaflets in the form of an oval ring, depressed in the middle, indicating perhaps the point of attachment of an indusium.

This fine species has as yet been found only in the concretions of Mazon creek, where it is tolerably abundant.

ALETHOPTERIS CRENULATA, Brgt.

(Fruiting) Pl. xiii, fig. 14 and 15.

Though the nervation of this fragment is scarcely well enough preserved to permit the ascertaining of its disposition, it is evident, from the form of the pinna and of the leaflets, that it represents a fruiting branch of this species. The leaflets united at the base, regularly crenulate around, with the borders apparently reflexed, are marked near the margin by two rows of scars of round sori, each placed in a curve of the crenulation, as seen fig. 15 enlarged. The medial nerve, like the veins, are obsolete, and the details of the nervation could be somewhat distinctly observed only on one of the leaflets. In comparing our figures with that of the sterile parts, published vol. ii of this Report, pl. 39, fig. 3, the essential characters are seen to be the same. This spe-

1. Alethopteris Mazoniana Lqx. Corrected surface of the lobes thick, implated, smooth, nonleathe coriaceous; lobes &c: perpendicular or slightly oblique. (20.6.71.). The lobes are generaly of such a thick substance that the veinlets are scarce y seen through the specimen except being marked by a mere depression. From this species should be separated as new: Specimen Al 44 & Al 50 with longer narrower secondary pinnæ, rachis narrower, deeper half round, leaflets shorter more distinctly separated though united near the base, leaflets irregular in length, shorter linear lanceolate obtuse, marked by a distinct nervation. Medial nerve no thicker than the veinlets: veinlets simple or forking once, turned upwards especially the three lowest pairs which follow the margin of the leaflets in curving along them. The upper ones are scarcely curved or arched backwards. see p. 3925. 2. (Item that A. Mazoniana has sometime, the leaflets pointed see

2 A. thopteris longifolia Presl. The form of Specimen Al 24 from great Nemaha River like Al 118 of Nebo Ohio considered as var: of this species should, I think be separated as species not only on account of the broader leaflets but especially from the very thin more or less approached veins which are perpendicular to the medial nerve. The division of the veins is the same in these specimens should be compared with a number of others of the same type. As for Alethopteris grandifolia Newb. examined from a large number of specimens presented to the museum by the author of the species, I do not see any difference from A. longifolia, not even enough to make a variety of it. 10.8.71.

3. Alethopteris Massiliona Lqx. Al 94a 94b? Doubtfully referred to this species. differing as it does by the broader leaflets the thin flexuous medial nerve and the decurrent base of the primary veins. should be compared with better specimens. 10.8.71.

4 Alethopteris Species nova, fragm., specimen Al. 79, 80, 83, 86. Only between pinnæ of this species. Pinnæ linear lanceolate? pinnules slightly oblique, disconnected, attached to the rachis by a rounded base or slightly decurrent base (rounded upward, decurrent downward) sometimes very sharp, perpendicularly long and narrow 10 to 12 millimeters broad 3 p to 4 millimeters oblong obtuse, entire; medial nerve thin, ascending to 3/4 of the leaflets and there abruptly disappearing in branching into veins, veins oblique, forking once near the base with one of the divisions forking again, generally the upper one, thick, distinct. Specification marked by two ranges of sporanges upon each side of the medial nerve, appearing over out in form or laterally compacted. On account of the broader specimens the species is not as yet satisfactorily known see below and Pecopteris Milleri?? see better spec. Callipteridium

5 Alethopteris obscura Lqx. This I think should be considered rather a Callipteridium. the nervation, the position and union of the leaflets being the same. the nervation as it is marked in my figure Rep. pl. H 5. fig 3 is not exact for all the leaflets. Generally the primary vein is not decurrent upon the secondary rachis and descends straight upon it as in my figure Penn. Geol. Rep. H 20, 1a and there are two side veins one ascending to the sinus, and simple the second between this and the medial vein ascending higher and dichotomous. the two branches simple the upper one forking again. There is with my plate H 1, 1a, H 5 a small paper indicating the true nervation. 11. 8. 71.

6 Alethopteris geminans? spec. nova? Name can be changed. (Simple pinnæ lanceolate to pectinate in outline 15 cm: long 3 cm: based at base with a broad median winged rachis, pinnately divided leaflets oval oblong, obtusely pointed or oval-lanceolate obtuse, opposite or alternate either distant or at least disconnected or separately two by two connected to the middle, indifferently turned upwards or downwards mostly perpendicular to the main rachis, texture of the leaflets apparently thick, surface convex and border not curved downward; medial nerve strong, ascending to the top, veins almost distant, forked once from below the middle, the lower veins rather turning upwards. This species is a very beautiful, distinct and remarkable one without analogy to any known as yet from the carboniferous measures. The oval large leaflets either widely distant from each other or connected by about the middle, their form oval elongated, the lowest pinnules being very small; all the characters are at a variance with other species I examined. It merely resembles A. Mazoniana the nervation. 12. 8. 71. var. of A. mazoniana.

7 Alethopteris (vratis? = Emersoni (Dawson)) spec: nova? A mere part of a specimen pinna (al. 37). Pinna linear, apparently long the specimen from the lower part of the, is 3 inch long without diminution in the length of the pinnules. Pinnule oval oblong, obtuse 3/4 of an inch long 3/16 in inch broad, pinnulæ, rounded at the base, attached to the rachis by their narrowed base, marked with a thick medial nerve ascending to the point and bearing on each side of it horizontal groups of sporanges forming continuous rows from the nerve to the margins, close to each other and covering the whole surface of the leaflets. The specimen is mounted and figured in the

characters are not very clear. On the reverse there are branches or part of pinnæ of the same species, evidently a Alethopteris bearing leaflets round in the upper part of the base, decurrent at the lower part, lanceolate oblong obtuse rounded at apex, media veins ascending to the point and secondary veins nearly perpendicular to the rachis three forthing, and close to each other. It was found by Moore, in connection with Dercuropteris Moori and I have seen at Prof. Andrew specimens referable to this species and found in Monroe Co. ala. in connection with a Dercuropteris like Moori, thereby differing by the absence of leaflets attached to the main rachis. (3.10.71).

D1 Al. Alethopteris hymenophyllioides Sigg. From Major Creek, Stevens specimens. We have at the Museum ~~three~~ specimens. Al 139, Al 140. Al 141. referable to this species or perhaps to Al. Mazoniana. They represent the point of a lanceolate or linear lanceolate pinna bipinnatifid divided, in two first with secondary divisions nearly perpendicular to a broad winged or flat rachis double furrowed in the middle secondary pinnæ linear, from two to three inches in length, ~~and~~ of an inch broad pinnately or equally divided in round lobes or roundleaflets united to near the point attached to the rachis by a broad base but not decurrent on it but rounded above and below; the inferior lobes slightly longer and separated to near the base. In the more divided lobes or pinnules a medial nerve ascends to the top and is pinnately divided in veinles forthing from the middle; in the less divided and nearly entire secondary pinnæ near the point of the pinnæ the veins go from the secondary rachis to the margin, forthing once. The texture of the leaflet is thin, not inflated as in Al. Mazoniana, the rachis is of the same form and breadth as marked in my figure, but report pl 79 fig 1. The veins are not turned upwards as in A. Mazoniana but curved or arched and forthing nearer to the base as in A. hymenophyllioides pl 10 fig 1. The specimen Al 140. is fructifying. The secondary pinnæ are more oblique upon the broader winged rachis, the lower ones bi-pinnately divided (the pinnæ in these bipinnately divided) the secondary divisions being short (examined) oval, pinnately divided in round small pinnules separated to the base, in ascending the pinnules become united to near the point forming still higher small entire oblong obtuse pinnules or secondary pinnæ pinnæ pinnatifid lobed. The texture of the plant is still thinner than in the forms the nervation totally obscured by the sloan to being fructifying, the surface being marked by round sporanges placed on both side of the medial vein of each pinnule. The points marking sporanges are proportionally large seeming to be divided in five starlike groups of sori as in Alethopteris Mazoniana. The two first specimens are placed with A. mazoniana this one with A. hymenophylloides.

D1 Al. Alethopteris Mazoniana fructifying. From better specimens Al 132 & Al 133 from N. Strong, the fructification of this species is better determined than from my figure in this report. In the large leaflets there is along the borders and on both sides of the medial nerves two rows of round sporanges, 8 to 10 on each side, divided in five obtanceolate sori attached to a round central point, forming a star or with equal rays or with rays elongated toward the medial nerve in specimen Al 131 the sporanges cover the breadth of the leaflets from the base to the point. in Al 132 the point only of the leaflet is marked by sporanges (3.10.71) their relation of position to the veins is not seen. Specimen Al 142 has the surface, epidermis destroyed and the nervation very clear. It shows that the division of the veins is regular, there forthing but once except the inferior vein of the upper part of the leaflets which forths twice, once near the base and once from the middle all the divisions being simple. It also indicates that generally the veins and their divisions are slightly arched but that at the base of the leaflets they sometimes turn upwards then ascending along the margins. The fructification or cells in spic. comm. aussi elle de Gonopteris emarginata ou le m. informe que elle ya Grimly figure de Dercuropteris (alethopteris) plerosa Al 32 fig 3 a. Il semblerait donc que presque toutes ces sporanges des espèces de houille sont de même forme. See p 393 (3)

D

D 1. Alethopteris Helena, sp. nov. CB. 42. Described from good and numerous specimens from Helena. I have now a number of fragmentary specimens sent from the lower coal measures by Mr Worthen N. 1. to 5. They all represent separate ultimate pinnæ very much like those of Alethopteris serlii. They differ however by the pinnules narrowed on the upper side toward the base, more distant decurring along the rachis by a narrow border, less oval lanceolate pointed or obtusely pointed and by the nervation which is at a slightly more acute angle of divergence, and the veins nearly all forking once and sometimes twice. The terminal pinnule is linear lanceolate tapering to an acumen or acute. This is evidently a good species but as it is generally the case my draughtsman has not represented it rightly the pinnules of fig 1 and of fig 2 descending more toward the midrib of the pinnule underneath. Copy. N. 1; at least a few pinnules. Al.

D 2. Among the specimens from Helena coal mine there are two (N 43 which I referred to Alethopteris lonchitica and which may be different, the nervation being closer and more oblique. One has distant leaflets, acute as in Brgt Hist 184 fig 3. The other has the leaflet enlarged and united above the base as in fig 1 of the same plate. The specimens are too imperfect for sufficient comparison as said above the veins appear more numerous and are certainly more oblique to the middle nerve, the nervation being that of A Helena. I believe that they truly belong as a rare Alethopteris Helena for I have from Aldrich's Tesla near a number of broken small specimens where the character of close nervation, acute distant leaflet etc are blended with those of the same type as I have described and figured them. The description should however remain of these species of which I should preserve specimens. Compare specimen. They other represent Pecopteris oblique Brgt. Hist. tab. 63. but. Alethopteris serlii Brgt. is in Helena the veins being [illegible] more oblique not [illegible] collected.

D 3. Al is clearly distinct by the very thick midrib of the leaflets, the secondary veins thin or thread. Simple or once forked from the middle or lower in right angle to the midrib. The only difference is in the size of the leaflet which are mostly shorter, narrower.

D 4 Alethopteris sp. nov. ? Ultimate pinna (spec. N 1561.) long linear slightly narrower toward the base and also toward the point (broken) Pinnules oblique on a broad angle of divergence, separated to near the base where they are slightly decurrent and join by a broad obtuse or acute rachis, lanceolate, acute more or less scythe shaped or curved inside, thick or coriaceous, the lower one more obtuse at the point and more open; middle nerve thick half round, ascending to the point, veins about in right angle to the midrib very distinct and thick, dichotomous, for the lower ones forking at the base and both branches forking once again near the border, the middle ones forking once or twice, one of the branches forking again, the upper ones only forking once. This pinna is much like Al. asperifolia as fig. by Brgt. Hist. pl 90, differing however by the lanceolate pointed leaflets. The author does not speak of the coriaceous substance of the leaves but he says that the veins are deeply marked. The character of nervation is also well described and like in this pinna as he says: nervulis bifurcatis vel ramulo alterno simplice approximatis valde notatis. This appears therefore to be a mere variety. - Remarked M. Wheterill - This species is very rare in the U.S.

see p 393 b. 2.

3936
Q. 1. Aletholopteris grandifolia Pl. LXI fig 3.4.
Aletholopteris spec. nov. ? Specimen No 101. from cannel tow a rather large lanceolate pinna, bipinnately divided - secondary pinnæ or rather pinnules somewhat obliquely narrowed & narrowed to the point, joined at a near the base, decurrent upon the narrow rachis, pinnately lobed, the lowest one 5 to 6 pairs the upper ones short entire or merely crenate, lobes divided to the middle, dentate crenate each with a middle thick nerve, alternately pinnately branching with branches simple very oblique & very slightly turned inside each entering one of the teeth. Terminal lobe short obtuse. The lower lobes have each three pairs of veins, none going to the base of the pinnule. The nervation is about that of Goniopteris. The rachis is apparently slightly margined & with a membranaceous narrow border. This
Q. 2. Aletholopteris aquilina, Brgt. pl. 1571 of the same locality as 1561 is also a var of A aquilina. The leaflets are less acutely pointed and by sinuation and form just like those of A Darreyi Brgt.
Q. 3. Aletholopteris Mazonensis sp. nov. As I supposed it, we only have seen parts of large pinnæ, either lower or upper pinnæ, probably lower ones. I have a splendid specimen from Mazon Creek No 1642 given by Thorp showing the top of a pinna. Triangular in outline, bipinnately divided in its lower part in horizontal linear obtuse secondary pinnæ; subdivided in short vertical oblong very obtuse pinnules united below the middle, thick inflated, obscurely veined, the middle vein marked merely by a depression, the lateral veins oblique, of the same character and degree of divergence as in the large leaflets, and simple a forking once near the base. The lower secondary pinnæ are 6 ½ cent long, one centimeter broad, only, the pinnules being only 5 millim long, the secondary rachis being little thin & distinctly channelled. These pinnæ are close parallel but not imbricating, rapidly decreasing upward in most so way that the ninth in ascending is only two cent long, merely undulate on the borders and the upper ones are here entire, mere pinnules like those of the larger pinnæ as fig 9 pl 4. This upper part has the appearance & and the character of a Pecopteris. I have one of these pinnæ No 1643 with simple leaflet separated & near the base which measures 16 cent long with leaflet variable in size from 11 to 15 millim long linear obtuse very entire. Another specimen No 1644 is a small pinna a little that of Pl X, fig 5 with close oblong obtuse leaflet deeply marked upon the stem wrinkled bearing at the base of the leaflet and a vein at the middle a large oval sorus like those of fig 5. and the nervation of Aletholopteris Mazonensis. I therefore believe that this specimen as also fig 5 of Pl. 10 represent the fruiting parts of this species as some of the leaflets have two sori one upon the other on the same side of the leaflet and as fig 5 of Pl XIII has the sori large and placed at the top of the leaflet only this also appears to represent the fruiting part of A. Mazonensis. A specimen of Thorp shows distant leaflets, obtuse crenate along the borders, the upper ones merely joined at the base, the other disjointed and deparate.

cies is generally rare, and its mode of fructification has not been observed before.

It occurs in the concretions of Mazon creek.

ALETHOPTERIS HYMENOPHYLLOIDES, Sp. nov.

Pl. x, fig. 1 to 4.

FROND large, tripinnately divided, with primary and secondary pinnæ alternate, turned upwards, ovate-lanceolate in outline, decurrent in a narrow-winged rachis; secondary pinnæ or pinnules either entire, short oblong, obtusely pointed, joined at the middle in acute sinuses; or longer, divided nearly to the base, ovate-lanceolate and pinnately cut into regular obtuse lobes with obtuse sinuses. In the short divisions, the medial nerve only is distinguishable; in the larger ones, the veins, though obscure, appear pinnately branching from the medial nerve in an acute angle and forking at the middle. But for this kind of nervation, this species should be considered as a *Hymenophyllites*.

Mazon creek; in concretions of clay iron ore.

ALETHOPTERIS INFLATA, Sp. nov.

Pl. x, fig. 5 and 6.

NOTHING has been found of this species but the fragment figured here. It shows part of a linear pinna, gradually tapering to the point, divided into broadly ovate, or ovate obtusely pointed lobes, enlarged and united near the base, marked in the middle by a short thick nerve pinnately divided by five or six pairs of arched veins forking once. The fructifications are marked by oval inflated large fruit-dots, placed at the base of the leaflets, one only on each side of the enlarged medial nerve. The surface covering these inflated fruit-dots is wrinkled above, and around them, as seen in fig. 6 enlarged.

In considering the form of its fructifications, this species should be separated as the type of a peculiar genus.

Mazon creek; in concretions of clay iron ore.

ALETHOPTERIS HALLII, Sp. nov.

Pl. x, fig. 7 and 8.

FROND bi-pinnate; pinnæ perpendicular to the straight round main rachis, linear, alternate, narrow, close to each other, apparently short, merely cut on the borders by obtuse narrow lobes, either emarginate or square at the top, separated by short obtuse sinuses. Veins and veinlets deep and narrow, the primary ones ascending to the middle of the sinuses and forking twice upwards as seen in fig. 8, enlarged.

This species is closely related to *Alethopteris serrula*, Lesqx., Penna. Geol. Report, p. 865, pl. xii, fig. 1, differing from it by its shorter, broader pinnæ, placed close to each other; by its more obtuse lobes, and by the primary divisions of the veins, ascending to the middle of the sinuses, and not to the point of the lobes. Though in both species the borders of the pinnules are apparently reflexed, these differences are too marked to be considered mere varieties of the same species. Nevertheless, it might be possible that the specimens from Illinois represent a sterile frond, and those of Pennsylvania fruiting branches of the same species.

Mazon creek; in concretions found by Mr. M. S. Hall.

ALETHOPTERIS EROSA, Gein.

Verst., p. 29, Pl. 32, fig. 7–9.

PECOPTERIS EROSA, Gutb. (1843.)

Numerous and large specimens referable to this species have been found by Mr. S. S. Strong, in the roof shales of the coal at Morris.

The American plant merely differs from that of Europe by the longer divisions of the three-pointed lobes, and by the much longer pinnæ. The same fronds, or parts of fronds, bear sterile and fruiting pinnæ; those especially in

× 1. Alethopteris Hallii Lsqx. The museum has a very fine specimen (# 145) of this species which is distinct. It is a whole pinna oval elongated in outline, [illegible]

[illegible] male specimen. #146 from Yeso. Has part of a different species mixed [illegible] and the specimen is too small for satisfactory determination. 27.10.71. See 1c.

? Alethopteris crispa Lsqx. The museum has a splendid specimen showing fructification. The species is well described and figured [illegible]

× 1.6. Alethopteris Hallii Lsqx. Specimen #165 of Storrs is fine, the nervation and borders of the leaves are preserved. Should be figured or at least in wood cut.

2.3 Alethopteris hymenophylloides, Lesqx. In the cabinet of Mr Storrs. I have seen, (1876) a very fine specimen of this species. It represents a pinna somewhat broader than the one fig X, fig 1, five centimeters broad, the preserved part about 10 cent long. The nervation is quite distinct and just as I have figured it.

4. Alethopteris ambigua sp. nov. see Description C.B 139. The description is accurate. Remark that in the upper or lateral pinnæ as in fig 3 of my plate of the species where the pinnules become very small. The veinlets become crowded but distinguishable and apparently twice forked. They are also more inclined. It is however extremely difficult to see the point of attachment of the veins and I believe that those which appear twice forked, the upper branch is simple and attached to the rachis and not to the superior division of the vein. The ~~area~~ nervation of the large pinnæ is exactly as shown in fig. 1a.

5 below 5b. Alethopteris Dawsonii? Lsqx. Prof. #114 of Butts. Has two pinnæ (ultimate coadunate) referable to this species of Dawson. One is more pinnatifid 1 1/2 cent broad with lobes oblong narrowed above the sinuses slightly enlarged below the obtuse point joined by an obtuse sinus quite near the adnate rachis. The other is large, pinnules 3 millim. long oblique more oblique than in the male pinna also enlarged at or above the middle obtuse, deepening near the base into an acute or sometimes obtuse sinus. But this however is not the essential character which is marked in the ~~obliques~~ veins, obliquely divergent from the midrib which though not broad is clearly marked and strong from the base to the point where it divides in two veins branches one. The lateral veins branch once at or above the middle or three once at the base and both branches or a single only branching again near the border. The substance of this species is thick. The specimens spread on a pellet of coal. The pinnules in ascending become ovate, obtuse and the terminal one which is broader is apparently obovate obtuse. The species might be identical with A. Owenii, but as far as I can see from the figures the leaflets in A. Owenii are less oblique, comparatively longer and more acute, and undulate. The difference is however not great.

? 5. This is positively A. Owenii, as the specimen #114 has on the reverse a pinna exactly like fig 1 of plate II of the Ass's Report. It is distinct from Dawsonii by less oblique more pointed leaflets, veinal nerves more oblique and diversely veined, ones being as mentioned above

394c

D1 Alethopteris lonchitica, Brgt. var. A large pinna represented in two specimens No 212, the lowest representing the lower part of a primary pinna 19 cent. long, the upper representing apparently the upper part of the same pinna. 23 cent. long. Between them there is an intermediate portion not found which should have been as long as 20 or 30 cent. for the upper end of the rachis of the lower part is seven millim. broad when the lower end of the upper part is only three millimeters thick. The secondary pinnæ also of the lower part are much longer, fourteen centimeters or more while the lower pinnæ of the upper part are only eight centimeters. Therefore the whole pinna measured at least 70 cent. long. The characters of the species agree well enough with those applied to A. lonchitica and to the figure also. The ultimate pinnæ, at least the upper ones as in the Hist. of Brgt. pl. 84 fig 1, ~~were~~ being short linear lanceolate open but curving upward with short decurrent obtuse or obtusely pointed leaflets joined at a short distance from the rachis ~~to~~ with the terminal one short, lanceolate obtusely pointed, one and an half cent. long, not linear but lanceolate and much shorter than generally the case in specimens of other species. As generally in the genus the pinnæ become entire toward the top and rapidely decreasing to the terminal leaflet, first they are undulate then entire long and the 6th pair above or under the terminal one is only 8 ~~cent~~ millim long. Also terminal leaflet is bitten at its base but does not appear longer than those of the lateral pinnæ. The pinnæ of the lower part have the pinnules lower, unparalleled narrower, separated by near the base and undulate. In all the nervation is the same; the midrib is thick, of the same thickness to near the point of the pinnules where they abruptly disappear. The secondary or lateral veins are thick very distinct, either forking from the base or simple. In the variety they are more generally simple, two or three simple veinlets between those forking. But also two or three forking ones follow each other. The veins are much thicker than in A. serlii and not so close.

D2 Alethopteris Owenii Dy. There are some specimens of this species in the collection of Gurley's. Some large pinnæ with pinnules obtuse, oblong smaller but with the appearence of A. Sullivantii shew exactly the nervation. it is obtuse at a more obtuse angle of divergence than in A. Sullivantii and less obtuse than in A. serlii with more distant veins generally forking once near the base and one of the branches also above the middle decurring to the midrib as marked upon my figure but midrib either thick & compressed or thick upon the lower surface or thin upon the upper surface Gurley. pl. 79 the large pinnæ the ultimate pinnule is short triangular or oblong obtuse

D3. Alethopteris Helena. A splended specimen of this species from the Sacksio Coal (Silurboniferous) below the Maxwell limestone of the Meredosia limestone of Illinois. It is covered by three parallel pinnæ 20 cent. long and distant about 4 cent. The secondary pinnæ are in right angle to the primary ones what measure 3-4 cent and are about as long as broad. The ultimate pinnæ are broad lanceolate, and apparently long more being preserved in the whole. The pinnules are more or less undulate, generally larger in the middle and the nervation as I have described it very irregular, the middle vein the strongest, the lateral ones either forking twice or thrice sometimes only one near the base, the two branches being simple generally undulate but not joining each other and alternate

D4 Dictyopteris

Plenty of specimens from Alabama, none with mucronate raches; the base of the branches is slightly lobed mostly shipping.

See p. 399 a 5.

D. 1. Alethopteris Lesleyana, or Pellimanga? This species is in very large and numerous specimens in Lesley collection, from Wellsborough. The specimen 70 cent long has pinna at least 40 cent long and at least 20 cent wide with rachis 2 cent broad. When deprived of the bark there are mostly or nearly 10, regularly and evenly striate with rounded tones, obscure point marking impression of hair of the surface bark. Upon the bark the veins are less deeply marked though regular and the point marking the base of hair-pit prominent and distinct. They are distant and scattered 1 to 2 mill. round or oval. The coaly pellicle of the bark is nearly ½ mill thick. The nervation is sometimes obsolete, but also sometimes very distinct. In the long leaflet at the upper part of the pinna the veins are three forked or more. In the small ones they generally fork twice, one near the base and another near the point. The lower leaflets are always more or less enlarged lobed at the base.

D. 2. (Alethopteris) Lesleyana? Lesleyana, sp. nov.? In Prof. Smith's specimens which I considered as D. nervosa, there are two. Sm 11 a & Sm 11 c which I think should be separated and constitute a different species. Sm 11 c is a large one, representing a pinnate frond at least. The frond is diversely crushed and its pinna and pinnules scattered. Its form is not seen. The primary rachis is thick, flattened, eight ½ tenth millimeters broad, its middle part, five millimeters, narrowly winged with two flat smooth borders two millimeters broad. The secondary rachis, four and one half to five millimeters broad basally, the middle part like a convex rib one millimeter thick and borders flat one and one half a nearly two millimeters broad; the tertiary rachis is two millimeters thick with the same character of a middle convex costa with flat borders (wings) and enlarges on both sides up and down in joining the border of the secondary one. The secondary pinna are broad, nearly in right angles to the primary ones, 14 to 18 centimeters broad and apparently lanceolate flat. The tertiary pinna also at an open angle of divergence are linear lanceolate gradually narrowing toward the top, a linear lanceolate more rapidly narrowing toward the point, seven & cent long, bearing large alternate pinnules inclined upward; pinnule large, either shorter, two centimeters long in the middle of the pinna, one cent. broad, oblong obtuse, or the lowest one on both sides up and down the rachis lobate at the upper and lower part, of the pinna but without lobe only on the lower side toward the rachis, all joining the rachis by a broad base, decurrent in forming the flat border of the tertiary rachis; the pinnules are longer, lanceolate pointed, two & two and one half millimeters long, pinnately divided in short obtuse lobes turned upward and disconnected to below the middle

To 396 a.

the upper part. They are scarcely lobed, and covered by groups of sporanges, apparently confluent, and of undeterminable form. Prof. Geinitz figures and describes them as star-like.

ALETHOPTERIS CRISTATA, Gein.

Verst., p. 29, Pl. 32, fig. 6.

Pecopteris (Diplagites) cristatas, Gutb.

We have only small fragments, which, by the size of the pinnæ and by their divisions, are referable to this species. As the nervation is obscure, it cannot be positively seen whether they do not perhaps represent different parts of a frond of the former species. The European specimens, at least so far as they are figured, leave us in the same doubt about the value of the species.

From the shales of the Morris coal.

ALETHOPTERIS MURICATA, Gopp., Syst.

Pecopteris muricata, Brgt.

Hist. veget. foss., p. 352, Pl. 97.

Good but small specimens of this species have been obtained in the concretion of Mazon creek. It appears to be rare in the western coal fields.

ALETHOPTERIS PLUCKNETI, Gein.

Verst., p. 30, Pl. xxxiii, fig. 425.

Nothing proves better than this species the insufficiency of our classification of the fossil plants of the Coal Measures. First, a *Felicites* for Schlotheim, it has been a *Pecopteris* for Brongniart, an *Aspidites* for Goppert, and now an *Alethopteris* for Geinitz. The form of its pinnules, especially those of the lower pinnæ, seems to force its admission into this genus. Some good specimens have been obtained from the shale of Morris, especially part of a tertiary pinnæ, bearing large leaflets with a broad base, lanceolate pointed, scythe-shaped in form, with the borders divided by alternate obtuse lobes, whose surface is

generally convex and polished. This form is the same as that published by Geinitz, being in all its parts larger than the common one generally found in the eastern Coal Measures.

Alethopteris spinulosa, Sp. nov.

Pl. xi, fig. 1 and 2.

Frond broad, bi-pinnate; primary pinnæ apparently long linear slightly tapering toward the point, divided into alternate broad, half an inch long, oval leaflets, joined above the base, cut at the obtuse top in sharp spiniform short teeth, separated by obtuse sinuses; main stem round, regularly and narrowly striate; secondary rachis straight and flat; medial nerve thick and enlarging toward its slightly decurrent base, with five pairs of alternate veins slightly curved upwards and forking at the middle.

This fine species has no relation, even distant, with any other published as yet from the Coal Measures. The veins and veinlets are not deep, but very distinct by their black color, as seen in fig. 2, enlarged.

From the roof shales of the main coal at St. John's, Perry Co.

Alethopteris falcata, Sp. nov.

Pl. xi, fig. 3 and 4.

The specimen figured represents a part of a simply pinnate frond, or of a pinna with simple leaflets attached to a main broad smooth rachis, by their whole unconnected base. These pinnules, about two inches long, are linear-lanceolate obtusely pointed, scythe-shaped and entire. The veinlets perpendicular to the half round medial nerve, are very close to each other, very thin, either simple or forked from the base.

On account of its broad curved rachis, of its long nearly linear leaflets attached to it by their whole base, especially of its obsolete nervation, the vein-

These pinnules either simple, undulat or pinnately lobed, have a strong middle nerve decurrent at the base, passing to the top with thin lateral veins forking one or two, curving to the border in an acut angle from the middle nerve, the lowest emerging from the broad decurrent base and not from the midrib. On the under side of the leaflet the veins are very thin and scarcely distinct, on the upper side also very thin but often inflated or tumescent as in Dicopteris nervosa. The nibbed base of the leaves is however not as thick as in this species not concave. From the different character the decurrent rachis and decurrent leaflet or pinnules from the form of these pinnules as also from the thin veins, this species is apparently different from D. nervosa. The rachis of a subordinate join the larger or anterior one in enlarging the border of the convex rachis and therefor the border appear as three wings for the middle convex part of the rachis join the three in passing through the borders or wings to that middle convex part and decurring into it. So this same with the pinnules which enlarge on both sides and are joined often at a distance of one centimeter by the winged border. This species therefore should go to the Genus Sphenopteris. For examining the descriptions and the figures of all the authors, Brongniart, Lindley & Hutt. Schp. Germ. when this species is figured, I find all the characters as described cent different from this one. It is related to the Sphenopteris latifolia and a subfolia of Brgt. see Sphenopteris pseudolatifolia f. 410a(5)

1. Alethopteris pinnulosa Lesq. The leaflet or pinnule of this species are very variable in form. Al 102 a specimen from Newport show part of a penne with secondary pinnae oblique to the flat rachis and pinnules close same position and about same outline as in my figure but somewat more acuminate or taper pointed and marked at the top by a few acut teeth sharply pointed or spinulose. There is not great difference from the figure except in somewhat longer more acut leaflet and less numerous more irregular teeth.

2. Alethopteris [illegible] Emmonsii? Sp. nov. A species represented by fm 4 - 9 with 9 fine pinnate pinnae. The species in its large form is intermediat between A. Schlei & A. Sullivanti. Its leaflets are smaller than in A. Sullivanti generally obtuse and shorter than in A. Schlei with the midrib very strong, abruptly terminating near the top as in A. Sullivanti and the veins a little more oblique than in A. Schlei but very close generally forking once from near the base, the branches parallel. The nervation is generally indistinct or obsolet on account of the thick epiderm. But it is clearly seen on some specimens showing the under part of the leaflets fm 7. and is as described above. The secondary pinnae has alternate lateral pinnae from a very thick primary rachis the secondary rachis also thick, the pinnules either disconnected or joined at the base, the fori in parallel close rows elliptic oblique to the midrib, apparently a compound of closely agglomerated small fori in lineal rows covered by a thick epiderm. The upper part of the specimen is sterile and though the leaflet are small they approach to the characters of the large one. This is therefore a species Alethopteris. The pinnae are sometimes small with small pinnules like Dicopteris as in the upper part of the largest specimen fm 4 see p. 396 c(2)

3. Alethopteris cristata Gein. A good species well distinct by its nervation, the lateral nerve being pal mated and the branches simple or furcate divergeing into the lobes as figured by Geinitz and described by Schimper who considers it a Sphenopteris with eight. See Carruthers Pr. Malay

D. 1 Alethopteris Gibsoni Lesq. Gibson specimen N.6. from Danville, Grape Creek. Ill. Only fragments of pinna. Lower pinna simply pinnat in lower other one cent long 1. 2 & 3 millim broad, joined at the base or near the base in others a mucronate short abruptly terminating at a distance under the point. veins nearly in right angle simple or forking once from the base. Upper pinna alternate distant at the simple, the terminal ones or pinnately lobed in half round very often pinnules with same kind of nervation, pinnae in right angle. Border of the pinnules reflexed covering sporanges which when erased show between coat very fine point as marked fig 6 a & 7 a. the borders are curved but no sporanges are seen. Species comparable to A. brevis Weiss. pl 11 fig 1. but not undulate on the borders. and with veins alternately forking and simple, not all simple as in Weiss. — From Gibs specimen now sent from the Agricultural colleg. the species is then very distinctly recognizable and seems to be A. brevis Weiss. see p. 397 c (2).

D. 2 Alethopteris Emersoni &c. The Agricultural colleg has a very large specimen which bears some fertil separat leaflet of A. Emersoni with large pinnae of the species which I considered a A. Illinoisensis. & then the veins are very distinct and generally forking twice ~~or~~ about little thin. It will be necessary to reexamine that species from St Clair ville and see if there is not a difference. — From comparison with Emerson specimen the steril pinnae of the College is not A. Emersoni but really Decurrens Illinoisensis Polymorpha. That of Emerson in the veins as described simple or once forked generally obsolete or indistinct, the midrib very thick and in the pinnae with small leaflets, the veins very oblique mostly simple and curving inward as in Goniopteris, either simple or forking from near the base. The fructifications are of the same character as those of Asterotheca as figured by Göpp. Genera III pl IV.

D. 3 Alethopteris ~~ambigua~~ lonchitica at least for the present is rather ambigua Lesq Sp. N. 528. with many other represent part of a polypinnate frond. of rest large size. The primary rachis of which fragment only are seen of 6 to 8 cent broad, the 2d rachis which is pinnat is three centimeters at primary division of pinnae simply 60. cent long placed either in ~~right angle or curved upwards and forward from a rachis the cent~~ about 1 parallel and close with a rachis of about 1 cent. broad, the ultimate pinnae close, contiguous along the border in right angle to the rachis, either curved upward a degree 16 to 24 cent long, the pinnules in right angle long 1½ to 2½ cent long as the width of the pinna forward the base is about 3 cent. leaflets or pinnules slightly turned down at the site nervation parallel mostly touching at the borders in the upper part they become more distant and more pinnules so they are generally linear often Nervation simple or the veins forking sometimes once near the base and then curved by a coalescing with the next vein. Quite different from Alethopteris ambigua, especially by the large size of all their part but most similar by the characters. — Describe it and make comparison to the species.

D. 4 Alethopteris ~~Grandini~~ Grandini as figured in Cat of Illus. is represented by two fine specimens [illegible] pinna 14 cent long lanceolate, 2 cent broad at the base [illegible] pinnules near the base 1 cent broad 1½ to 2 cent long [illegible] leaflets of the pinnules [illegible] the veins [illegible] the midrib [illegible] the veins [illegible] short very oblique or half rounded [illegible] the veins very oblique mid rib

1. Alethopteris serlii (Brgt.) Gpt. specimen 107 of Prince, the base part of a pinna, near the top with the lowermost pair 6½ mill. apart

2. Alethopteris Grandini Brgt. (Fig. from Zeiller, Bassin houiller et permien de Blanzy et du Creusot, pl. 39 fig. 1.). The specimens of the Agricultural college from Conway are very large one of them 50 mill. and when the various forms of the species, a part of the stipe upon one of the specimens measures flattened 8 cent. broad. It is easily recognized by its thick, all coaly pinnæ irregularly lobed, the specimens easily detached being ¼ of a mill. thick. The many pinnæ very long, none preserved in its whole length. linear lanceolate, with broad rachis 1½ cent broad, the lowermost pair 7 mill. in the upper part. Lower secondary pinnæ oblique, rapidly parallel distant three cent at base. With broad rachis flattened, 5 mill. at the base, still more than one mill. wide the small half round obtuse terminal pinnules. Tertiary pinnæ also oblique with a broad rachis 2 mill. thick and flat, linear obtuse short, the lowest 3 cent. long gradually decreasing toward the top pinnules, to be a divided, pinnules short half round, the lower ones only 3 mill. long and three to four mill. at the base where they are united as seen in my fig. 4 & 5 pl. 28. The terminal leaf marked in fig. 33 pl. 33 compound, comparatively large. In the upper part of the frond the secondary pinnæ are longer curved downward somewhat obtuse, the tertiary ones of the same size as described rather shorter and narrower than the leaflet more and more obtuse to the apex in the upper part or toward the point. They are very narrow and merely articulated 25 millim. long 2 mill. broad and three nearly terminal fifteen mill. long and 2 mill. broad. The undulations are marked only upon the 7 last pairs of terminal pinnules as seen in my fig. 5 & 4 and their undulation preserve the pinnate disposition the pinnules merely gradually diminishing in length. Separate branches both the frond in fig. 6... from the pinnules of the lower tertiary pinnæ connected at base one of them by linear obtuse decurrent base. The midrib of the pinnules and the veins are as figured, broad midrib abruptly terminating in the upper part of the leaflets and the veins parallel either simple or forking once. It is difficult to separate this species from that of Weiss. A. Overeinder. The comparison of the author, however with with A. pulcherrima Gpt. and A. tenuifolia Gpt. are not right. The author makes a A. longifolia of Gœppert are not right. The author makes Alethopteris genus from reflexed borders of leaflet a pinnules and Algo a A. longifolia Gpt. confuses A. pseudograndini Weiss. In the whole number of specimens examined, I have seen none with fig 1. of Weiss with the pinnules linear all undulate at the border. Pl. XXXIII fig 1. represents a few secondary & tertiary pinnæ from the large specimen of the Ohio agricultural College

borders of the leaflets are always reflexed but do not show traces of spores or of fructification.

397 b

Callipteridium mosquale

Callipteridium mosquale Sullivant n. sp. MSS. We have only the three fragments of ultimate pinnae figured here. Nos 181 2 sp. 184 & 187 ab. 2 pc. on only of the last is not figured. - Pinna of various size 10 cent long or more, linear lanceolate rapidly narrowed toward the point into a short obtuse oval obtuse terminal pinnule, sometimes rather linear ever narrowed to near the base and enlarged near the point as in one of the figures[2]; leaflet oblique generally in an obtuse angle (obtuse generally (60°) from the broad rachis, joined at the base, linear & oblong obtuse, the largest one 1 ½ cent long, five millim broad, rounded distant but narrow, enlarged by channel ascending to near the point; lateral nerves close, generally distinct, curved or arched, deeply inversed toward the base becoming more and more acutely oblique toward the point, rarely simple, forking once or twice, one third of a millim. distant along the border, half united or obtusely keeled, not marked in the base or border joining the pinnules. - As seen in fig. (181). the leaflet are sometimes narrowed at the base and oval and distant & the flat channeled marked borders of the midrib, the direction of the lateral veins gives to their species. has a relative to A. Sullivanti: while the nervation therein close and more minute relates it to A. Wilsoni: the abrupt termination of the pinnae by a obtuse short pinnule is somewhat like A. Emersoni. the leaflets are of unequal length and variable in form and size. On rachis when covered with the epidermis is marked by the decurrent midribs which distinctly pass upon it and descend the flexuous alone it. When deprived of the epidermis the rachis is smooth. We have seen it only for the specimen of Carmel Ohio. (Compare specimens when received. Correct.) Of this species figured pl XXXIII real number fig. 2. represents a narrow pinna with leaflets some one larger near the top, shorter in the middle of the pinna, joined at base. Fig 3 & 3a. a pinna with narrower longer leaflets and more distant nervation; fig 4 top of a pinna with oblong oval leaflet joining the first pair under it nearly at the top of the leaflet fig 5 a fragment with oval leaflets distant and reminded to the point of attachment. Remark that the midrib is more generally narrow slightly flexuous. The broad space marked in fig 3 & 3a being rather a depression in the middle where the true midrib is seen marked 3a.

A fine specimen just received (Feb 7. 79) upper portion of a pinna showing the three upper pairs of leaflets short entire 2 to 2½ cent long 8 mill broad decurrent the lower one becoming undulately lobed 5 cent long, minutely lobed with short half rounded lobes the segment photographed by Lee of C. Sullivant.

lets being scarcely perceivable to the naked eye, this species rather resembles a Cycas than a fern. With a strong glass, the veinlets are seen as marked on fig. 4, enlarged, and these indicate the true relation of the plant.

The specimen may represent a part of a frond in the process of unfolding its leaves, which appear as being pressed upon each other on the lower side of the rachis, and at the same time, still half uncinnate. It may also be the representative of a species in its full development. Some *Lomariæ* of our time resemble it, by the nervation and the form of the leaflets. It has no relation with species known from the Coal Measures.

Mazon creek; in concretions of clay iron ore.

Alethopteris solida, Sp. nov.

Pl. xi, fig. 5–7.

This species is, like the former, known only by a fragment of a frond or of a pinna. It is pinnately divided into narrow leaflets, attached to a proportionally very broad flat rachis, by the enlarged base of a thick medial nerve. These pinnules, a little longer than one inch, perpendicular to the main rachis or slightly turned upwards, are linear obtusely pointed, disconnected at the enlarged rounded base, and entire. They bear along the borders, at equal distances from each other, round groups of sporanges, apparently divided star-like into five round dots, as marked in fig. 7.

By the position of its *sori* and of its leaves, our species is a *Polypodium*. It resembles by these characters the species published by Prof. Brongniart, under the name of *Phlebopteris polypodioides*, Veg. foss., p. 372, pl. 83, fig. 1, and if the nervation should prove to be the same, the American species would be distinguishable only by the broad rachis, the enlarged base of the medial nerve, and the separation of the leaflets. No trace of secondary veins or veinlets is observable on the specimen, which is in a concretion from Mazon creek. Our species is also related to *Polypodites elegans* and *Polypodites Lindleyi* of Goppert.

Alethopteris Lanceolata, Sp. nov.

Pl. xiii, fig. 1 to 3.

The specimens represent two parts of simple pinnæ or of fronds, with alternate linear lanceolate obtusely pointed leaflets, oblique on the rachis, or slightly scythe-shaped, narrowed at the base to half their width, and rounded to the point of attachment to the rachis; entire on the borders and smooth on the surface. Main or medial nerve half round, moderately thick; secondary veins attached to it in a very acute angle, alternately branching from the base in veinlets curved inwardly, as marked fig. 2, the upper ones ascending to the borders of the leaflets, the lower ones becoming confluent in ascending.

Of the two specimens which have been seen of this species, and which are figured here, that of fig. 1 seems to represent the upper part of a frond, while the other, fig. 3, looks like the terminal part of a pinna, and therefore the species is apparently bi or tripinnate. The nervation resembles that of the following species, but the veins and their divisions are more oblique, more slender and of a more delicate texture.

Mazon creek; in concretions.

Alethopteris emarginata, Gopp.

Syst. foss., p. 274, Pl. xvi, fig. 1 and 2.

Pl. xiii, fig. 4.

We have in the concretions of Mazon creek many separate leaflets of the same form and of the same size as the one figured. The borders of these linear obtuse leaflets are slightly and equally undulate-lobed, as formed of pinnules connate to the top; the nervation is nearly similar to that of the former species, the secondary veins being only more open to the medial nerve, or nearly perpendicular to it, while their branches, generally more marked and thicker,

1 Alethopteris Lancevolata sp. nov. and: leaflet entire on the border, 3986.
slightly undulate. Some of the leaflets are entire, some visibly undulate. The
main nerve is half round, marked in the middle by a narrow groove. This
character is distinctive to separate the species from A. emarginata Gopp. —
For in reinlets curved inwardly: say: in very thin ~~nearly effaced~~ scarcely perceptible
reinlets. Mus: specim: Al 64 & Al 74 – 20/6. 71.

Ma 3946a.
2 Pecopteris (Alethopteris) subnervosa Rœm. Frond bipennat; primary penna
Lanceolate (two parallel, the upper part only seen) secondary pinnæ open the lower
ones 6 to 7 cent long gradually shorter, the upper one only one and one half
centimeter all alternat; divided in alternat broadly ovat lobes, jorned to
the middle, turned upwards, obtuse, the lower ones or the inferior side of
the pinnæ slightly larger but entire, of the same form attached half to the
main rachis. Rhizt is broad flat, three millim. in the lower part and
slightly flexuous. R^s medial nerv of the lobes distinct, except in the lower
inferior lobe, a little more distinct than the veins, veins on the lower side of the
lobes three two or three from the main rachis, the other from the medrib,
forked once near the bar, parallel, all flexuous part tending toward the borders
then curvey inside and upwards in joining the border, veins of the upper side of the lobes
the lower curving inside, occurring to the bar of the medrib. the other oblique to the medrib
and passing to the border, forming at the bar less flexuous only curved upwards
in reaching the border. The venule is marked here. The figure of Rœmer
enlarged fig. 11. b. Pl. XXXI is correct enough but the veins
are marked thick by the inflation of the epidermis, when
seen distinctly the lateral ones are double, forming at the
bar, flexuous, as figured by Ruehl. Tal. XIII. f. 5 c. Where
has seen figured the also simple copying figure & description of Rœmer
without having only Pecopteris sp. Alethopteris. Ruehl fig. however
shows the rachis (primary) slightly flexuous as seen in our specimen
Our specimen shows only two fragment of secondary pinnæ one of the
the 10 cent long. ~~on~~ the upper secondary pinnæ have the lobes in Caflet
connected more and more toward to near the point apex and pass evidently
to simply pinnat at the top, the last pinna preserved being entire on
the border as with the lobes scarcely indicated by undulations. The form
of the divisions a lobes has a likeness to those of Odontopteris intermedia
Lesq. and from the basilar nervation this species might even be referable
to Odontopteris than to Pecopteris. But apply I have no for Comparison
to the specimen obtained for Alth. for the description of O. intermedia

3 Pecopteris reticina; Lesq. ... Ma. I. seem referable to the species. Has ~~subpinnat~~
bipinnat pinnæ, 10 cent long with short secondary pinnæ 4 cent long
nearly in right angle or slightly oblique upon an imbedded apparently broad
rachis with small, slightly oblique, oblong obtuse pinnules distinct to
the bar, often distant and rounded at the base. Some of the pinnules
five to six millim long three millim broad are evidently villous upon
the surface, with venation indistinct; in others the surface is smooth apparently
by erosion and the veins are seen thin, curved and nearly in right angle to the
rachis, generally forking once at the bar sometime the branches forking again.
The broad secondary rachis with two millimeters indicate also a
large primary one. The base of the pinnules are also rounded to the point
of attachement as in P. reticina. The leaflets are small however, the
terminal pinnules of the same.

(2)

(2) Pecopteris Cistii Sternb. Specimen I of Mansfield shows the top of a bipinnate pinna with oblong basally joined at the base only disconnected pinnules & upwards with lateral veins bifurcating twice or once and the lower division also only once. I can not see the difference between the specimens Pecopteris polymorpha. The character of the top pinnules or the same the lateral veins more or less curved backwards, pinnae short rapidly diminishing in

towards. Most probably Pecopteris polymorpha Brg. Pl 39 fig 1-3.

D.3. Pecopteris (Aldrychia) Aldrychi (another name) Abbott specimens, n° 46, 248 spec).
Frond fully pinnate. The larger fragment shows a rachis somewhat
the 4th, 5 to 6 millim, very thinly and regularly lined with three
pinnae (secondary) about in right angle linear lanceolat, gradually narrowing
to the point (point trifolder in all the specimen) Secondary rachis slightly flexuous
especially in the upper part by the inflation at their point of union of the tertiary
rachis both these and the former half cylindrical and minutely lined.
Tertiary pinnae in right angle or sometime slightly inclined upward and or
slightly arched linear lanceolat, gradually narrowing to the terminal lanceol
obtuse pinnules; the basilar or lower ones seven cent. long, about 1/4 cent
broad at the base pinnately alternately regularly lobed, pinnules oblong
obtuse, closely, entire joined from the base generally at the base sometimes rounded or cut rarely and
disjoined. Lower pinnules undulately pinnately lobed, the middle
and upper one entire oblong obtuse inclining toward the point. Those
of the upper tertiary pinnae gradually shorter broade opening
4, 5 pinnately lobed pinnae both similar to the lower pinnules
(see plat). In some specimens the pinnules enlarged at the base are rounded
are then triangular, the point being however slightly obtuse. In some others
they are all distinct and disjoint see fig 2 & 3 small form the pinnules thong
preserving the same characters become very small, 3 mill long 2 mill broad at the
lower one pinnately undulately lobed as in the large forms, 5 mill long & 2 broad.
substance thick surface convex or inflated nerves thick very distinct, generally
forking once below the middle with a simple branch from the base or more
simply forking. This species has some affinity to Ad. neuropteroides especially by the
thickness of the leaves and the coarse nervation. The divisions (ultimate) or pinnules however

Pteris stenoi Eaton; 1 specimen # 3106 of Morris has two broken simple pinna referable to this species. They are apparently long, one is undulate, three inches long, a mere part of the wholes with 8 leaflets 2 inches long in the upper part, becoming shorter low and the base, spreading perpendicular to the rachis, oblong obtuse, slightly enlarged above, distant, attached by the base while narrowed upward and slightly decurrent downward. The surface of the rachis is covered by a thick carbonaceous pericle marked by small bands as if it had been ribbons. The medial veins is flat, broad and undistinct. The veinlets plainly visible through the pellicule are very oblique broad and nothing once. 12.10.71. — In specimen of the species # 314 show the upper part of a frond with secondary pinnae with three of the terminal pinna 3 pairs and terminal one 3 inches long perpendicular to a broad rachis the secondary rachis, divided into ovate obtuse lobes, united to the middle, abruptly decreasing to a contracted nearly entire obtuse point. The epidermis is thick, the nervation obsolete, but apparently a oblique nervules either simple or forking one pinnae inflated medial nerve. (see page 528 of this rep. fig. 1.)

2. Pteris Milton. Brg. # 1566 & 67 from Salem & Sharp, Mt. below Fremont Schuylkill Co. Primary pinna large 30 cent. long upon the specimen with the top and base broken 16 to 17 cent broad rachis smooth obscurely striate. Secondary pinnae nearly in right angle or scarcely oblique slightly curving upwards, much longer in the middle 4 cent, only 6 toward the base regularly shorter toward the top broken, linear lanceolate gradually decreasing to the point formed of a small oval, or obovate lanceolate acute pinnule. pinnules longer toward the base generally joined just near the rachis, sometimes separate at the base shortly connected on the border to the middle, oblong very obtuse broad and short, averaging 8 mill long and 4 mill broad, middle nerve thick and distinct below the point, veins in a broad angle of divergence from the midrib curving backwards and in right angle to the borders when reaching them forking once toward the base and both branches forking again near the border. The veins are distinct but not very deeply marked. Differs from Brg. Schuyl. Pteris &c. description by the secondary pinnae longer and tapering pointed or gradually decreasing toward the top. The rachis in the middle 3 millim. broad. Specimen # 1570 has a fragment of dissected pinna with a row of lax flattened sori each side of the midrib as rendered by Brongniart.

see 3996 a. 2.

D2 Pecopteris Mellonii. Brg. A small specimen from Mount Gap. Mg 2581 represent a few pinnæ of this species with pinnules broad and short very obtuse, separated to the rachis, even those nearest the base distant, as broad as long. 5 mill. both ways. Those of the middle are longer but also very obtuse and comparatively broad. The nervation is of the same character as D2 in the specimen described 399 c. 2.

D3 Pecopteris arborescens. Lacw. Specimens No 1676 to 1701 represent a simple pinna of this species with sterile pinnules and two small pinnæ fertile. The sori are in groups of 4 to 5 sporas (corpuscles of spore) in a circle, very distinct, placed on each side of the rachis as I saw them at once Removed either upon or between the simple veins. It is impossible to see their relation to the veins which is seen from the sterile pinnæ are simple, there are 4 or 5 of them sori appearing on each side of the medial. Hooked See figured, Pl. 1. fig 4. 5. which are exact.

D4 Pecopteris platyrachis Brgt. We have two specimens from Lapwell positively referable to this species and to P. arborescens to which Schimper & others identify it. Ma 230 represents a young pinna, with a broad flat rachis with secondary pinnæ oblique short lanceolate pointed. two inches long at the base, gradually shorter toward the point, seven millimeters broad. secondary rachis flat and comparatively broad. pinnules very close and very narrow, linear oblong contiguous from the base to the point scarcely 1 millim broad, 3 to 4 millim long, with the middle nerve distinct only. The other specimen 204 also of Mansfield is part of a larger pinna. with flat, broad punctate rachis nearly one cent broad, secondary pinnæ slightly oblique linear gradually pointed, 8 eight centimeters long with pinnules in right angle to the broad flat rachis, comparatively narrow linear oblong irregular in length, with distinct lateral veins forking. The characters are positively those of Pecopteris arborescens. the rachis however is broader and flat. This represent also P. Cyathea of Brgt. Part of this may be figured

D5 Pecopteris Silimanni, Brgt. Specimen Ma 226 which has been figured more distinctly represent this species than any of the numerous specimens which I have seen from Millersburg and Carbondale. This species which is finely figured on plate has to be preserved as Sphenopteris squamosa same as published in the 4th Report of the Pennsylvania. The specimen 226 represent a small part of a tripinnate primary pinna with secondary pinnæ very oblique to the rachis, linear with three or four pair of alternate oval oblong entire lobes, oblique and slightly decurrent disjointed, only the upper joined more or less, The terminal lobes very obtuse. The leaflets or pinnules have no trace of nervation except the midrib which is seen clearly in a depression on the inflated surface. The surfaces smooth at least not Squamose as in the Sphenopteris squamosa.

D6 Sphenopteris squamosa. There one specimen Ma 398 whose leaflets are inflated around or the borders as if that was a fertile part. See figure from p. 398 c. (3) more regular, more generally disjointed at the base not a slightly decurrent when united, the pinnæ and pinnules smaller, regularly divided by alternate segments, the rachis evidently lined, the whole appearance allying them different. ~~Neuropteris~~ Lesquereux C. to p. 111. ~~has distant relations to this~~.

ascend to the border of the leaflets. This kind of nervation is that of Goppert's species. But in our American specimens, the leaflets are broader, shorter, and by the increasing depth of the divisions of the borders, they become by degrees cut into lobes nearly to the base, and then are undistinguishable from *Pecopteris unita*, Brgt., except, perhaps, by the medial nerve or secondary rachis, half round and not quite as thick, and by a thinner texture of the leaves. The fructification is marginal, in round distinct *sori* which sometimes become irregularly scattered by compression.

Genus PECOPTERIS, Brgt.

Pecopteris Strongii, Sp. nov.

Pl. xiii, fig. 7-9.

Frond simply pinnate or poly-pinnate, pinnæ linear tapering above to a point, slightly narrowing toward the base. Pinnules alternate, perpendicular to the striated narrow rachis, nearly one inch long and proportionately narrow, linear obtuse, often slightly enlarged at the obtuse point, attached to the rachis by their whole, sometimes enlarged base, disconnected and often distant, the distance between them being sometimes as wide as the breadth of the leaflets, becoming closer to each other towards the point of the pinnæ, where they are shorter and connate at base. Fructification, marked by scars of broad round *sori*, with a concave point in the centre, placed near the borders of the leaflets, close to each other, ten to twelve on each side of the pinnules. Their place in relation to the veins and veinlets is unknown, the substance of the leaflets being thick, coreaceous, and the nervation obsolete.

As it is seen in fig. 7 and 8, enlarged, the borders of the leaflets are slightly undulate, an irregularity apparently caused by the compression of the *sori* expanding the margin, or passing out of it, for in fig. 9 all the pinnules are entire on the borders. This last specimen seems to represent a small frond rather than a pinna, for the leaflets turn downwards towards its base, as is the case in some simple fronds of species of *Polypodium* of our time. By its form

and the position of the *sori*, our species could also be compared to *Aspidium Wrightii*, Mitt. of Cuba. Its place is, therefore with the *Polypodites* or *Aspidites* of Goppert.

The specimen fig. 7, is in a concretion form Mazon creek; the others on shale from Morris.

Found by Mr. S. S. Strong.

Pecopteris squamosa, Sp. nov.

Pl. xii, fig. 1 to 4; Pl. xiii, fig. 10 and 11, fructif.

Frond evidently bi or tripinnately divided, triangular or lanceolate in outline, with a thick rachis, half an inch or more at its base, covered to the top of its last divisions with long, linear lanceolate pointed scales, either straight and appressed to the stem, or open and diverging all around, even sometimes appearing as dried up and crumpled as in fig. 2. The rachis of the last divisions is proportionally broad as seen in fig. 1 and fig. 4, enlarged, and is also either scaly or marked with crowded points indicating the base of the scales. Secondary pinnæ long, linear, slightly tapering to an obtuse point, flexuous or curved upwards, bearing alternate, unequal, narrow linear, obtuse, oblong leaflets, nearly perpendicular to the rachis, reflexed on the borders, very close to each other, or often contiguous for their whole length, marked with a deep medial nerve, but no trace of veins. These leaflets, generally more or less irregular in their length, have their fructification indicated by small round dots, placed in two rows, close to the borders; the dots are numerous and distinct; their relation to the veins and veinlets is unknown.

The species is quite distinct and only distantly related to *Pecopteris platyrachis* Brgt. The specimen represented, pl. xii, fig. 4, shows a part of a frond of this species, in its process of development. The divisions appear still unopened and the outline only of the secondary pinnæ with mere traits of medial nerves, are indicated by flakes of ~~scaly~~ coaly matter.

This specimen is upon shale from the roof of the coal at Colchester; the other specimens figured are in concretions from Mazon creek.

(1) Pecopteris oreopteridia Brgt. spec. Ar 1562 Salem ri of Sharp Mt near Vernon
The specimen is referable to the variety described p. 402 b (1). which by its facie
resembles P. arborescens but may be a new species. It represents the top of a pinna
with a somewhat thick half round rachis; lower secondary pinnæ, close
obliquely to the rachis; narrow linear lanceolate, gradually tapering to the
point formed of an oblong obtuse pinnule — as in Brgt pl 105 fig 3. The pin-
nules of the lower leaflets are short, inclined upwards, joined at a distance
from the rachis, enlarged at the somewhat decurrent base or cordate-obtuse
The middle nerve is thick slightly decurrent in joining the secondary rachis
and the lateral veins forking once except the upper ones which are simple
are at an acute angle of divergence from the mid rib, ascend to the borders
without curving backwards, except those of the lower pair which curve
inwards. As in the form described p 406 b, the upper secondary
pinnæ become simple by the gradual decreasing of the pinnules which
pass to a gradually narrowed or lanceolate point with a terminal pinnule
like those of the secondary pinnæ.

From same specimen N 414 represent also a lower part of a pinna with ultimate
pinnæ nearly at right angle or slightly curved upwards close, long linear comparatively
narrow 10 cent. long at least, only 13 to 14 cent. broad with pinnules mostly
free to the base though connected on the borders as close; a larger part of a pinna
of the same character as in 105 fig. 2 of Brgt with broader rachis and longer pinnæ
the pinnules very obtuse and the nerves derived from near the base as in Brgt.
fig 1 of the same plat. The veins of the same specimen are either oblique crenat
an acute angle of divergence or nearly in right angle to the midrib.

(2) Pecopteris truncata [illegible] 403 b 1 404 c 2.
[illegible] 18–12 millim broad toward the base with linear or oblong obtuse pinnules, repre-
sented to the naked eye as entire, very unequal on the pinnæ or arborescens which the specimen resemble some 7 some 5 millim long. The rachis
is flat broad punctate but much less so than in P. villosa though the
surface of the leaflet is still more [illegible] very closely
punctated. At the top of some pinnæ it becomes entirely smooth. One
specimen No. 204 a [illegible] top of pinna 4 cent long with ultimate
pinnæ 12 to 14 millim long 2 to 3 millim broad [illegible]
only 1 millim. and the [illegible] millim broad [illegible]
[illegible] There is a small branch part of ultimate pinnæ apparently fruiting,
pass figured at fig 2 [illegible] 502. [illegible] the fruit appears like
[illegible] placed near the borders of the leaflets and all around. The
pinna is [illegible] Near the base of this pinna is [illegible]
part is with fragments of [illegible] pinnæ upon the same specimen. See
specimen with fruit — To this I refer a fruiting pinna from Camelot Mo 294 with open linear
pinnæ pinnules separate to the base inflated, truncate with the form of the sori obliterated by
circular carbonaceous matter, leaflets 3 millim long 2 mill. broad the outline of the sori is
visible but not distinct.

2011 b.

Clinton

T. Sagenopteris rostrata ? Ld. N° 204 of Butts in a large number of specimens resembles S. rostrata by its character, nervation, thick consistence of the leaflets with villous surface, subdivisions in secondary and tertiary pinnae with small halfround pinnules etc. But the rachis is generally smoth and comparatively broader than in the species S. rostrata as I have figured it. We may therefore have only two species. It is however to remark that my fig. 1 has also a broad rachis, striated and rarely punctulat and that some of our species like S. dentata have the rachis either punctat or rough a most. This may depend from peculiar circumstance of the growth or from the age of the fragments that have been preserved. — In comparing the specimens of this 204 with those of S. Clintoni, I find them to represent the same species mostly in small leaflets. All smaller than they are in my fig. 2 of the plate of S. Clintoni or like my fig. 5 of the plate of S. rostrata. The veins are forking twice, once from near the base and once from the middle or above it. It is however uncertain if the specimens where the nervation is somewhat destroyed do not belong to S. rostrata for their rachis is not rough. I do not believe it however, for they all have the same thick coarse lealy surface. Hence both these species differ mostly by the rachis broad smoth in S. Clintoni not quite so large and punctat or scaly in S. rostrata. This species S. Clintoni has a very large frond the rachis also comparatively large, and flat; one upon N° 220 measuring one centimeter in width smoth or irregularly striat.

D 2. ... this ~~rostrata~~ elliptica ... in the Lesquereux collection ... 389 numerous specimens seems to represent the species ... The pinnae are detached. The largest specimen on ... all recent ... secondary pinnae distant, narrowed upwards, lanceolate ... the upper ... nearly ... terminated ... acuminate pinnules ... pinnules oblique all separated ... at least, only ... by half the base ... to the base rarely ... margin ... most commonly ... with ... apparently ... the two lateral veins ... these ... curved ... the lower forking twice. ... the upper ... the middle one ... often ... twice ... more specimens it is quite distinct and clear. ... the ... pinnae ... separate one, all ... leaflets ... the same character ... of ... One ... rows ... often ... simple ... specimens ... somewhat large ... found ... on the same ... One of the large leaflets ... base of the pinnae ... undulate ... other ... Two ... veins ... one ... veins ... only one ... near the midrib, not ... veins ... I found that this is their normal position. This agree well enough with the species of Bunbury which is figured in my Catalogue p. 152. Compare it with S. distans sp. of the Penn. 1st Report.

Pecopteris Pelecylandi Brgt. From Specimens 9-11. 9-189. 9-191. 9-171 & 9.

dates of Mazon creek except the last. Pinnal large, pinnules of each

pinna with inches wide. Rachis prominent & middle

the pinnules arrangement very regular

[illegible] inches or [illegible] pinnules

[illegible] pinnules [illegible] rachis [illegible]

[illegible] pinnules [illegible] rachis [illegible]

[illegible] pinnules [illegible] rachis [illegible]

2011 # 1

and one D. 11. (see D. 5 this page)

D 1. Pteropteris Buckland: Bzl. 11 specimen D. 18b from below Rotherhithe has all the characters of this species and is evidently referable to it by form of leaflets pinnæ & nervation &c. But Brongniart places it in the section of the smooth rachis, (rachis glabre) and in our species, though the rachis is almost even polished it is marked by warts which though scattered and somewhat distant show that it was planted by hairs or scales. The rachis is therefore slightly or distantly muricate. 11.10.71.

2. Pteropteris crenulata Bzl. Among numerous specimens referable to this species, there is one, D. 20 which distinctly shows the fructification. The whole under surface of the leaves appears covered with large round sori apparently involucrate or scaly covered. When these sori are opened or have left the leaflets the surface appears as covered by minute pin holes or excavations, irregularly scattered but close to each other. The fructification of this species has not yet been described. But as the nervation of the fertile leaflets is somewhat obsolete it is not quite certain that this is the true P. crenulata. It might be a new species. 11.10.71.

D 2 Pteropteris Watkinsoni? Bzl. The specimen D. 17 which I refer with doubt to this species has only separate secondary pinnæ long (5½ inches) proportionally narrow (a little more than ½ inch) linear, tapering to a point (sharp point) with pinnules and nervation as marked in Brongniart figure and description. But Schimper Pal: p. 509. refers this species to Pteropteris Desfrancii, nervo medio indistincto supra basin soluto nervis secundariis angulo acutissimo ascendentibus while in our species, the medial nerve is distinct, ascending to the top of the leaflet and the veinlets ~~regularly~~ nearly curving nearly perpendicular to the medial nerve as indicated in Bzl. fig: p. 11.2 fig. 4. Our species is by the length and form of its pinnæ & well marked on 11.10.71.

D 4. Pteropteris Stiptica (Lamb). It is represented especially by specimen D. 16 and appears identical by every character. I referred this species to my P. distans of the Penn. Rep. But the nervation is as indicated by Lindley and not as marked in my species. Whereas in our specimen the secondary pinnæ are short and not undulate &c. &c. description which agree with specimen 11.10.71.

D 5 P. Buckland. A specimen D. 11 is also referable to this species. It shows with D. 12 a slightly muricate rachis and though in appearance much like P. Polymorpha or Millana has the pinnæ shorter all the leaflets entire and the nervation less divided. Both species are easily confounded 12.10.71. = 403c. 1.

D

D

D

Pecopteris Sillimani, Brgt., Veg. foss., p. 353.

Pl. 96, fig. 5

This is one of the rarest species of our Coal Measures. The few specimens which I consider referable to it, are small and incomplete; one of them is from Mazon creek, in concretions of clay iron ore.

Pecopteris Bucklandi, Brgt., Veg. foss., p. 319.

Pl. 99, fig. 2.

The specimen representing this species, distinctly shows the character indicated by the author. The pinnæ are straight, nearly horizontal (four inches long with the end broken off), the leaflets oblong, somewhat lanceolate obtuse, but not quite as obtuse as in Brongniart's figure, slightly scythe-shaped outwards, etc. The pinnules are of a thick coriaceous substance, concave, and deeply impressed upon the stone.

Found in a concretion on Little Vermilion river, by Dr. J. C. Winslow.

Pecopteris Candolliana, Brgt., Veg. foss., p. 305.

Pl. 100, fig. 1.

One good distinct specimen, in a concretion from Mazon creek, while numerous specimens from the same locality have branches, with characters intermediate between this species and *Pecopteris cyathea* of the same author.

Pecopteris hemiteloides, Brgt., Veg. foss., p. 314.

Pl. 108, fig. 1.

The specimen from Mazon creek, is half a concretion, representing part of a pinna, bearing oblong, slightly pointed leaflets, disconnected at the base, with borders inflated, and a double row of large *sori*, unlike any other hitherto seen of this genus. These *sori* open by a transverse split, agreeing with Brongniart's fig. 2 A in every peculiarity of form. Our specimen does not show any trace of nervation.

PECOPTERIS VILLOSA, Brgt., Veg. foss., p. 316.

Pl. 104, fig. 3.

This species is the most abundant of all in the concretions of Mazon creek, which show it in its multifarious forms. The nervation does not appear to have been seen by European palæontologists. Brongniart does not give any details of it, and Geinitz indicates it as simple, or with veinlets forking once only, which is totally at variance with its true nature.# The concretions contain numerous parts of the plant preserved in a state of partial maceration, either with pinnæ whose substance is destroyed, and which have nothing left but the outlines of their leaflets, and the entirely free veins and veinlets; or pinnæ half preserved, one part of which bears leaflets with the villous epidermis, while the other part has the veins and veinlets free of epidermis, and quite distinct. From the form of its pinnule, the multiple divisions of its pinnæ, and of its veins, this *Pecopteris* is exactly similar to *P. polymorpha*, Brgt., the veinlets dividing once or twice or more, according to the place and size of the pinnules.

PECOPTERIS ARGUTA, Brgt. (fruiting.)

Pl. xiii, fig. 12 and 13.

The part of a pinna, as represented in the figure, bears leaflets, connate at the base, oblong, lanceolate obtuse, somewhat shorter, more pointed, and more distinct than is generally the case in sterile pinnæ of this species. But as the nervation, as well as the crenulate-toothed borders of the leaflets, are similar to those of *Pecopteris arguta*, and as these peculiar characters are not known in any other species of the coal, I consider this specimen as representing its fruiting part, which was before unknown. The *sori* appear like inflated dots placed just at the point of the simple veins or rather like conical *sori*, with the point to the inside of the leaflets and the enlarged opening outside at the point of the teeth, as marked, fig. 13, enlarged. Their form is distinct; with a strong glass they even appear filled with a pulverulent matter. According to the form and the position of these fruit-dots, the species resembles an *Aspidium*, and should be placed in the genus *Aspidites*, Gopp. Sterile pinnæ of this species are not rare in the shales at Morris.

1. Pecopteris arguta Brgt. fruity. — A small but very good specimen obtained at Morris Ill. 19.5.71 from Lawyer P. A. Armstrong. Shows that my description of the fructification of this fern is not quite right. The specimen is part of a pinna bearing 5 alternate pinnae which are linear lanceolate obtusely pointed, about two inches long, nearly horizontal upon the broad (1/8in.) striated rachis. The linear obtuse pinnules are separated to the base though their borders are closely approached. The strong simple veinlets are slightly arched in going to the border and bear close to the border each one large round sporangium in which from a central depression or hole seems to have had an indusium attached by the center. This species therefore is referable to the Aspidiea. The specimen is distinct, the sporange also well marked thereon the upper surface of the leaflets. The number of the veinlets is generally 8 pairs with one odd at the top. These veinlets are alternate, thick, round. (1.6.71). Hay on creek S.S. In examining species of Aspidium of my collection I find A. oligocarpon Kze A. marginum Kaulf. A. lonchodes Sats all of Cuba. just like P. arguta for nervation as well as for form and position of sporanges. This species is therefore a true Aspidium! Schimper in his Sal. veg. p 521 has this species in his section of Pecopteris Aspidioides. See for fructification and nervation Lastraea Dalmatica Heer Fl. Tert. Helv. Tab. IX fig. 1d.

2 Pecopteris villosa Brgt. At least what I consider as the European species has the rachis very [illegible] and is then undistinguishable from P. polymorpha. It always differs remarkably by the [illegible] pinnae, which always deeply [illegible] and [illegible] specimen. We have to separate into a new species the large specimen of which [illegible] 668, which has villous leaflets and muricate rachis. The main rachis is [illegible] very broad not quite so much ribbed or not ribbed at all muricate, bearing short obtuse secondary pinnae, sometimes flexuous or turned upward, with small [illegible] leaflets oblong, obtuse, [illegible] to the base where they are connected by a narrow band. The nervation of the leaflets is far different from that of P. villosa and might be well compared to P. stenopt. The surface of the leaflets is villous, [illegible] with [illegible] crust. [illegible] is visible also in strong [illegible] the [illegible] division of the veins which are three branched at and near the base. [illegible] above. The secondary pinnae are [illegible] than in P. villosa. Besides this large specimen we have fol. 9 bis [illegible] 1871 represented by two [illegible] 8 pairs of leaflets, [illegible] long, [illegible] broad, [illegible] pinna has 24 inches long. The secondary pinnae are only two inches long, slightly longer in the middle where they bear [illegible] and [illegible] upwards very closely [illegible] an oblong [illegible] [illegible] less than one inch long, the pinnules smaller but still distinct. It is referable to the 3d form of P. arborescens as described in the vol. p. 403 b 1. See 401a. 3.

3 Pecopteris ~~pulcherrima~~ ~~sepultifolia~~ A small species of which we have many specimens for it creeps and of which I sent specimens to Brgt at one time. Seemed to [illegible] It is represented by 1, 1, 122 half [illegible] nerves [illegible] 404 [illegible] 1967, [illegible] 818 [illegible] [illegible] pinnae [illegible] divided [illegible] [illegible] [illegible]

1092 b Te

D. 1 Pteropteris oreopteridicus Brgt. A very variable species. Among the specimens of the museum which I refer to this species, Tour P. 48. seems to differ in many essential points. It represents two parts of an apparently large frond. One, the middle part? has two pinnae perpendicularly attached to a broad smooth rachis, 5 m/m broad. The pinnae are lanceolate, about 4 cent. at base, 8 cent. long with numerous secondary pinnae which are linear tapering to an obtuse point with small oblong obtuse contiguous pinnules, united at base, scarcely two millimeter long, with a deep medial nerve vanishing by division below the top and oblique veinlets forking once or simple. The secondary and tertiary rachis are proportionally broad. The second part appears to be the point of the frond. It is 10 cent. long, triangular in outline, pinnate, the primary rachis a little more than two millim. broad, smooth, with secondary pinnae alternating, becoming horizontal above, 3 cent. long, near the base with oblong contiguous pinnules proportionally narrow, 5 m/m long, scarcely 2 m/m broad, with the same nervation as in the former. Near the point of the frond or pinnae the pinnules become more and more connected and their secondary veinlets are many more and merely equally lobed, undulate or in border. The essential difference in this species consists in the broad rachis and the small size of the pinnules which are much narrower than in my Pt. form of this species. 13.7.71. It has the general appearance of the small form of P. arborescens but the upper surface of the leaves is covered with a thick epidermis and the veins and their nervilles are thin and perceptible with difficulty. One of the essential characters also which separate this species from P. oreopteridis is the obliquity of the veins which reach the border in an acute angle and not in a very open angle as marked for this species. The Brgt. description of Pteropteridicus Foss. flor. p. 317: nervulis medio vel prope basin furcatis, margine vix obliquis. For this species we should say, nervulis supra medium furcatis margine valde obliquis. A large number of specimens under as yet by me as var. of P. arborescens or P. oreopteridicus belong to this form. Viz: P. 25, 45, 120, 21; it has to be described and published as new. But if not a new species it is a var. of P. arborescens. nervulis furcatis ramis simplicibus. See p. 1001 a (1). - Sitzb.

D. [illegible] Veinlets [illegible] 8. 10.71. This species is pretty well described [illegible] with characters besides those mentioned above are: [illegible] like the veinlets free or represent the points of two secondary pinnae [illegible] veins are forking once [illegible] the nervation at least, is the upper part of a primary pinna with secondary pinnae [illegible] slightly arcuate, oblique, the pinnules all decurrent united above the base to the [illegible] the nervation is the same [illegible] each rachis is decurrent as follows, [illegible] with pinnules 1 cent. long, disconnected [illegible] the base in the middle on both sides, veins forking once except the lower pair which has one of its branches sometime forking again! At 60 still large secondary pinnae with surface destroyed by maceration. All these veins are forking twice, [illegible] the middle of the leaflet, even [illegible] pinnae with pinnules open on one side, adnate on the other, rough on upper part [illegible] 128. 9.10.71. [illegible]

1. Dictyoteris Buchlandii Bgt. 1 number of specimens 1.88 from Eagle reef Do. represent many forms of divisions of pinnæ and leaflet which are identical with those of D. polymorpha, bipinnate fronds with horizontal secondary pinnæ from a broad slightly muricate or muricate rachis, smooth except the points; secondary pinnæ 0.5 cent: long linear tapering to a point with pinnules contiguous, connected at base along other, somewhat buried especially in 2 nd to shaped, 1 mill: broad, increasing to the point, reached in the lobe by a median nerve distant vascular bundles but thin, ascending 3/4 of the leaflets; sinus oblique, dichotomous, forking with the upper pinnule nothing again or merely toothed once — In the second form, the secondary pinnæ, of the same sort but smaller have somewhat serrulate rachis and the leaflets narrower, less contiguous though connected at base, further down pinnules entirely lacking, the lateral veins on the borders non continuous (disconnected to the base) In D. polymorpha and a 4th form of the same species all on the same thalli has the secondary pinnæ much smaller with short oval leaflets connected to the rachis. From the venation, the smooth but muricate rachis, I refer this specimen to D. Buchlandii. of which we know only the small fragment published by Brongniart. see this species D. 401 L. 1 & 2. see this page 403 a

apparently D. Buchlandii.

Should be figured.

2. Dictyoteris polymorpha. Bgt. There is still a great deal of uncertainty about this species. Some of the specimens referred to it have serrulate rachis and leaflets smooth, others forked have the secondary pinnæ opposite, others alternate, the leaflets of the former often more than twice forked, the latter rarely more than twice forked, the veins of the former often disconnected from the base, those of the latter always connected at base, the former with the pinnules contiguous, the latter with the pinnules distant, the former with the pinnules entire, the latter with the pinnules serrulate, the former with the pinnules obtuse, the latter with the pinnules acute, the former with the pinnules ascending, the latter with the pinnules spreading, the former with the pinnules dichotomous, the latter with the pinnules forking once, the former with the pinnules forking twice, the latter with the pinnules forking thrice, the former with the pinnules forking four times, the latter with the pinnules forking five times, the former with the pinnules forking six times, the latter with the 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D 2 Pewpteris lepidorachys Brgt = P. arborescens Schp. I have two specimens S. 41 & S. 42 this last fructified from Mayo creek which by the divisions of the frond and of the pinnæ, the linear form of the pinnules which are of various length, and the fructification which as Schimper says is of P. arborescens S. 409. is represented by large sori which fill nearly each lobe on the upper head of each side of the pinnules. It is however different by the nervation with is either forcate or bifurcate and the surface covered with hairs. This form could relate to P. lepidorachis Brgt. but does not appear to go with the P. arborescens. (send to Schimper.) Perhaps S. 42. should be referred to the same. It is a simple pinna with long linear obtuse leaflets 12 millim. long 2½ mill. wide, free to the base which is slightly enlarged horizontal or slightly curved upward with the surface hairy and all the veins open and forking once near the point or above the middle. I know nothing agreeing with this form. The veins as thick like inflated the point of division or forking is obscured as if the vein above were divided in spread like or hair like branches. This should also be sent to Schimper. The specimens are from Avery 1874 Sp. S. 41 & 42 are similar to P. distans as figured by Goeppert but the rachis of this species is smooth. S. 42. is comparable to P. pteroides Brgt as fig. by German Tab 36. S. 40 is also of the same type. For this 42. compare also Pec. Candolliana in German pl. 38 as also S. 41 & 42.

D 3 Pewpteris arborescens? fronting. The collection of New Brunswick has a fine specimen No 3 with the characters of this species by the form of the pinnæ, pinnules and leaflets. The sporanges are marked by a series of holes along the midrib apparently on each side of a simple raised vein [illegible] His not positively seen in the sporanges are upon the veins or between

See page 399[3]

PECOPTERIS ELEGANS, Germ.

Polypodites elegans, Gopp., Syst., p. 344.

Pl. xv, fig. 10.

We have in abundance, in the concretions of Mazon creek, specimens which agree in every point with the figures and description of this species. Pinnæ, bearing linear leaflets, entire on the borders, round at the top, marked by medial nerves from which branch in an acute angle simple veins, ascending straight to the borders, or sometimes slightly curving upwards. But the characters here indicated are so variable and passing by such inappreciable transitions to those of the true *Pecopteris unita*, Brgt., that after the examination of many hundred specimens, it is impossible to point out a single trait which could be described as distinctive of one of these species. I therefore consider this *Pecopteris elegans*, Germ., as a variety of *Pecopteris unita*, Brgt.

PECOPTERIS ASPIDIOIDES, Brgt., Veg. foss., p. 311.

Pl. 112, fig 2.

Found at Mazon creek; rare; seen only in two specimens.

PECOPTERIS ABBREVIATA, Brgt., Veg. foss., p. 337.

Pl. 115, fig. 1 to 4.

Numerous and very fine specimens in concretions from Mazon creek are referable to this species, rather by the figures given of it by Geinitz in his Versteinerimgen, than to those of Brongniart. The secondary pinnæ are short, all equal, the veins and veinlets much inflated, the pinnules more generally disconnected f. c. f. It is altogether a different species from *Pecopteris Miltoni* Brgt., to which the German author unites it as a variety, at least, if we consider our American specimens identical, which, however, may represent a new species.

PECOPTERIS DENTATA, Brgt.

Veg. foss., p. 336, pl. 124.

A fine species found in large specimens in the shales of the coal at Morris, and also in the concretions of Mazon creek.

PECOPTERIS FLAVICANS? Presl.

Sphenopteris flavicans? Presl.

Sternb., Vers., vol. ii, p. 127. Pl. xxxviii, fig. 1, *a*, *b*, *c*.

From Mazon creek also, and in concretions, we have obtained a number of specimens of a species which appears closely related to this species, if it is not identical with it. They represent parts of fronds or pinnæ, bipinnately divided; primary divisions alternate, open, straight or slightly flexuous, linear, bearing alternate, oblong, short, obtuse pinnules, connate at their base, slightly decurrent, with a decurrent medial nerve; alternately branching in simple veins, two or three on each side, turning inwards in ascending or straight to the border. The fruit dots are marked in a double row near the borders of the leaflets, apparently placed upon the veins. The main rachis and its divisions are deep and grooved. But for the position of the *sori* and of the thick epidermis of its leaflets, this species could be referred to *Oligocarpia Gutbieri*, Gopp., the disposition of the deeply marked veins and the form of the pinnules being alike. As this *Pecopteris flavicans* is not mentioned by any recent author, not even by Unger, and as it is known only by the short description and the incomplete figures given of it by Sternberg, our species is referred to it with doubt.

PECOPTERIS CHŒROPHYLLOIDES, Brgt.

It is remarked, vol. 2, p. 443 of this Report, that this species was still uncertain, having been found only in incomplete specimens. It has been obtained since from the roof shales at Colchester in large and good specimens. Except *Pecopteris Cistii*, Brgt., *P. velutina*, Lesqx., *P. Newberryi*, Lesqx., all the species of *Pecopteris* enumerated in the 2d vol., have been since found in Illinois.

1. Gecopteris Huttoni Brgt.? from specimen G.54 is apparently this species but intermediat 6
G. acuta. The laflets are undulate on the borders as in the former species, enlarged at base, oblong
obtusely pointed, turned upwards or slightly scythe shaped. The secondary veins at the base of the leaflets
are dichotomous forking near the base and the upper division forking again, in the upper part of
the leaflet they are much forking once as in G. acuta. 12.10.71.

2 Gecopteris Clarkii Lyg. I refer to this species specimen G.196 from Hazor creek. It is the point
of a rachis or pinna with a broad regularly striated rachis in primary alternat divisions
bare also a broad rachis, turned upwards distant from each other, alternat, closely approaching
secondary pinnæ half an inch long, diminishing to the point of the primary pinnæ bearing
close perpendicular small oval or oblong leaflets, only two millim. long, mid. broad distinct to the
base slightly decurrent and connected at base, becoming united near the point of the pinnæ as in
the specimen of this section. The veinlets are obscurely marked but evidently forked once, except that
the veinlet in nr. division and nearly resembles as in the specimen of G. Clarkii. There is no difference
whatever between them 19.10.71.

3 Gecopteris lepidophora Brgt. This species is evidently a different one (the description p 402 a. 3.
differs at first sight by more coarsely and [illegible] ... consideration is apparently at variance [illegible] ... Fig 5 a. show the form of the secondary pinnæ and their position, natural size. G. shows
by enlarged view of the pinnule fructified pinnules with discharged sporules of the sori.
pinnules are broader and narrower linear obtuse. They are shown generally as
rounded at base [illegible] that the nervation is produced [illegible]
of the decurrent base the veinlet bifurcate, [illegible] the base of the leaflet
the front of the specimen 2.11.71. [illegible] upon the secondary rachis and upon pinnæ
leaflet the villosity appears to have been coarse and thick. The primary rachis is sometimes
present [illegible]

4 [illegible] cat. sp.t 1868 Pl 1 fig 12 [illegible] which I have ever seen is marked S.S. 186. Lesquereux it must resemble if not the same species I [illegible]
Secretan it [illegible] in Record vol. 18 p. 141 fig 5. n. 6 a. It is also very much like a species
of Eustrix figured Tab 5 fig 4 & 4 a not described in the pamphlet. The nervation of pinnæ &
leaves in both species is the same.

5 Gecopteris dentata Brgt. In this species the rachis is muricat in the upper part and
smooth when enlarging downward or rather the upper branches only are muricat. See spec. G. 946.

6 G. microphylla Brgt. st specimen from M. Tyler McWhorter of Aledo Ill. No 8
bar coal measures, locality not marked, appears to represent exactly the species
It is bipinnatifid. primary pinnæ lanceolat 45° cent. broad at the base and in
the middle (the fragment is 10 cent. long) secondary pinnæ at a very open angle of
divergence, linear lanceolate, pinnules slightly decurrent alternat nearly in right angle to the rachis
or somewhat inclined toward the point, short, averaging 5 millim long, narrow, two
millim or a little more at the base pinnately lobed, lobes four pair in the longest pin-
nules, toward the base of the pinnæ 3. and the 2 pairs toward the point, lobes half
round cut or divided near the rachis, terminal small obtuse, the basilar
pair on each side of the middle larger; Middle nerve distinct, at base
somewhat distinct, lateral veins evolet. This species agrees well with
Brongniarti fig. 2 description — It is now figured, as far as it can be seen
and seen to differ from Brongniarti figured by the lobes shorter or not as
deeply separated, by the decurring base of the pinnules and also of the
mid rib. By these characters it is more like Gecopteris Cherophylloides
Brgt. Pl 195 fig 1 & 2 differing much however by narrow pinnules
half round lobes more deeply cut. The nervation is about the same
as in this species. The specimen comes from Chester Co. May be new.

apparently [illegible] Thelypteris figured by Gaudin IV pl XVI or new compar. Sphenomeris chinensis nervosa Sp Pl

D1

decurrent

but rarely

bare

The description for venation and fruit is wrong. See p 411 Vol 1.

D2. Pteris [illegible] quadriaurita Retz. This is the species described 403 b 1 as a var of P. arborescens. It is not the species and is separated under this name. I have from Strong a specimen showing the fructification of this species [illegible] 1660 in part of a large frond which I have seen in his cabinet. The sterile pinna is 31 cent long oblong lanceolate in outline 10 centimeter broad in the middle, decreasing toward the base and taper pointed; the secondary pinnæ are five to six centimeters long, linear obtuse narrowed to the point, the basilar ones open, the upper ones a little more oblique or turned upwards, pinnulose, small, disjointed to the base, scarcely more than four millimeter long and half as broad, round truncate at the base [illegible] midrib thick lateral veins totally absorbed by a thick often thinning epicleurium bearing when fructifying two ranges of sori on both sides of the midrib enlarged at the base fixed upon or between apparently simple veins. The fructification is regular the veins is not distinct the fertile pinnæ are upon the same specimens as the sterile frond. There is in Gaudin a P. crispata truncata Host but it is an Asian species see Icon Pl Ivey. 1585 (See 400 a/2)

1 Sphenopteris inclusa Germ. Specimen 1649 & 1650 (double) from Mazon creek is referable to this species (or rather perhaps to S. vertita) by shorter broader pinnules, secondary veins merely forked and surface smooth like the rachis. The specimen represents only an ultimate pinna 7 cent long linear abruptly & rapidly rounded to or obtuse pinnules; leaflets 8 millim long four millim broad smooth decurrent and attached by the middle lower middle precisely as figured by Germar and described by Schimper Tal Veget.

2 Sphenopteris hemitelioides Brgt. 1661 a small specimen from Mazon creek represents an ultimate pinna with oblong obtuse slightly decurrent leaflets turned upwards and nervation exactly as in Brgt fig. 2 B pl 108 The only difference is that from this imperfect description the leaflets are separate to the base while in this pinna they are joined a little above the base or near the rachis. As I remarked in my description p 141 p 6. the lower veins are generally turned or curved upwards, very thick or deeply impressed and little inflated or doubling near the point. (see below. 2)

3 Sphenopteris asplenioides Brgt. The specimen not valuable but sufficient referable with doubt to S. granulata. One specimen from Mazon Creek 1665 agrees in toto with figs and description of the species by Brgt. The pinnae (ultimate) are however in right angle to the wrist or primulate rachis and the pinnules a little longer and broader. It is the only difference. The nervation is the same, veins simple in a very open angle of divergence and curving backwards. As Brongniart remarks the appearance or facies of the species is quite different from that of S. arborescens. The rachis of the ultimate pinnae is broader the surface of the pinnules wrist a not smooth; the veinlet far more prominent or thick and thus more distinct. The leaflets are alternate & irregular in length. I consider it a good species. Note that it is from Mazon

D 2b. Sphenopteris hemitelioides Brgt. Spec. No. 8 of Porter from Summit portage in a few specimens, a pinna with secondary pinnae in right angle, straight, distant or separated from each other, 4 to 4½ cent long, the largest one pinnately equally lobed lobes or pinnules short oblong, obtuse, inclined toward the point or outside, 4 millim long 2 to 2½ millim broad with nervation of the species, that simple or veinlet nearly in right angle to the midrib. In passing up the secondary pinnae become shorter the pinnules united nearly to the top and finally the pinnae pass to the simple pinnules which are linear and gradually diminish in length toward the top of the pinna. The terminal pinnule is obtuse. (Specimens of S. arborescens from Mazon Creek have not yet been found.)

D 4 Sphenopteris Clintoni Spec. ined. This species represented by spec. 109 and 109 a, b, d, e, fill one plate. It is a large fern. Frond polypinnate primary pinnae lanceolate alternately pinnately branching. Secondary pinnae linear lanceolate, obtuse, of various length and width according their position, cut in alternate lobes or pinnules the inferior ones sometimes pinnately undulate lobed along the border while in the upper pinnae they are entire all oblong or linear obtuse, joined at or near their base or united to the middle or even above the middle. Sometimes as in fig. 1. the leaflets are irregularly divided decurrent and united at the base or free and sometimes but distant beside by a narrowed base simple or bi tri lobed on both sides or lobed one side and entire at the other longer or shorter upon the same pinna and therefore multiform. I have not observed this polymorphy in other specimens which have generally the pinnate lobed division of the Sphenopteres quite regular. The texture

405 6.

of the leaves is covered by a rough punctal crust or epiderme which entirely hides the veins or renders them obsolet. This epiderme easily separates in lamellae, leaving the under surface prent upon the lobe and distinct, but upon this also no trace of nervation is distinguishable. The enlarging part 3 & 4 a shows the nervation as far as it is possible to see it in very few leaflet and it is not quite evident or sure that this exactly represented. The veins are alternate from a somewhat undulate midrib slightly decurrent or currying to the rachis and emerge at an acute angle of divergence, forking once at the middle. By the nervation of enact and the thick punctulate epiderme, the species is comparable or related to P. retuta, the more so that the pinnules are of the same character but the leaflet of the species a pinnules are broader their lobes or pinnate division also broader more obtuse, half round and the strial rachis is not punctulate nabrous. Moreover in P. retuta, the veins are always more or less distinct and more curved toward the border. In the pantry specimens the veins are less regularly placed and less defined on the new species. Generally apparently crowded and covering the whole surface of the leaflet of which no trace of border is seen fig 5 & 5 b enlarged. Britts specimen Clinton, abounded and mixed with P. retuta. see #4002. 1.

D 1. Pecopteris species nova olim P. abbreviata figured from spec. 5514555, 1654; the distinction of the leaflets as also the nervation and the punctuation. In the pinnulate bipinnate frond as in fig. 6. the pinnules attached by the whole base are decurrent at base, the sinus between borders joining the base of the [illegible] inferior pinnule is decurrent to it. as in the enlarged part fig 6 a. In the undivided pinnules the base is not decurrent and the pinnules are united at the base or sometimes to the middle gradually passing toward the point in mere undulation of lobes. The nervation is as figured. The midrib is marked by a broad depression but the obscure midrib is marked as the veins unite at the middle and decurrently somewhat separately from the depression or midrib. The lateral veins are much curved backward and just as figured being inflated at the under base prominent by the deep cut of the veins. The divisions are multiple as the veins twice forked a nervation analogous to that of P. Williamsi and P. rarinervis abbreviata or fig. 4 b Gein. But there is a marked difference in the very broad rachis of the ultimate pinnae and in the generally twice forking of the veins especially inflated toward the border. This inflation is not remarked either in Presl a in Geinitz. The division of the veins is however much like that in Presl. P. abbreviata. The punctuations are unknown as yet. The surface of the leaflet is in some specimens covered by great round elevated points irregularly placed as in matter fig 5 b enlarged but these points do not represent veins as they are scattered equally upon the rachis and broad midrib. This apparently veins of the same division as the Williamsi. The ultimate nervation is that of Pecopteris Churchilli but it differs much by the character of the division of the frond.

D 2. Pecopteris Cistii Presl. A specimen Britts N. 146. two fragments of pinna a secondary pinnae with long oblong leaflets and nervation similar to that of C. Cistii. The rachis is not seen.

see N. 3984. 2

Genus STAPHYLOPTERIS.

Presl. in Sternb. Vers., ii, p. 174.

Count Sternberg, in his Versuch, loc. cit., defines this genus merely as: *inflorescence or fructified panicles of ferns, analogous to those of Botrychium or Aneimia.*

The only species described by the author as the type of his genus: *Staphylopteris polybotrya*, from the Tertiary of Europe, represents a small group of round sporanges. In our American species here described, these *sori* have various forms. But it is convenient to consider them under the same generic name, till their relation to sterile fronds, or their true generic affinity can be ascertained. To this genus, therefore, I refer all agglomerations of sporanges of various forms, either borne upon separate plants, or upon separate segments of a plant, like those of our species of *Botrychium*, without visible remains of leaves, or whose connection to frond-bearing leaves can not be traced, and is unknown.

No species referable to this genus has been found as yet in the Carboniferous strata of Europe, a fact which led Palæontologists to suppose that ferns bearing fruits in separate panicles did not exist at the time of that formation. From our Coal Measures, we have previously obtained only *Staphylopteris stellata*, Lesqx., Arks. Geol. Rept., vol. ii, p. 309, pl. 2, fig. 2 and 3, from the Sub-Conglomerate coal of Arkansas. The discovery and publication of the following species is, therefore, a valuable contribution to the fossil flora of the coal.

Staphylopteris Wortheni, Sp. nov.

Pl. xjv, fig. 1 and 2.

Frond bi-pinnate, ovate lanceolate in outline; pinnæ linear, gradually tapering to an obtuse point, short, one inch long near the base of the frond, scarcely half an inch near the top perpendicular to the main rachis; pinnules alternate triangular, formed of an agglomeration of three or five *sori* apparently attached to a main pedicel, but without trace of leaves. The main rachis of this fruiting segment of a fern is proportionally thick, three lines at its base, finely irregularly striate, the branches or pinnæ appearing attached rather upon it or

around it than along its borders; the rachis of the branches is also thick, smooth, and on both sides of it are attached the groups of *sori*, three to five in number, in a kind of pyramidal position, with a thick short pedicel in the middle. The *sori*, when unopened, are round, marked on the flattened surface by four or five lines diverging from the center to the circumference. Fig. 2*a*. When opened the sporanges appear placed like the rays of a star around a central point. These sporanges, oval, elongated or gradually enlarged outwards from the narrow point of attachment, deeply concave, finely striate within, are all turned to the same side, viz: the point downwards and the branches tending obliquely upwards; in that way the upper *sori* of the pinnæ have the point towards the rachis, while in the lower ones it is turned from it: see fig. 2, enlarged twice, and fig. 2*b*, enlarged four times. The sporanges are deeply marked or excavated in the stone, which is still more deeply penetrated by the point, and this point appears, as said above, to have been attached to a common pedicel by filaments now destroyed.

Found in a concretion from Mazon creek; discovered by Mr. M. S. Hall.

STAPHYLOPTERIS ASTEROIDES, Sp. nov.

Pl. xiv, fig. 6 to 8. 7*b*.

FROND tripinnate, with straight alternate branches; primary pinnæ lanceolate pointed or tapering to a point from an enlarged base; secondary divisions alternate linear, merely formed of narrow, filiform, obliquely straight branches or common pedicels, bearing groups of sporanges pinnately attached to them in pairs and opposite; *sori* round at first and before maturity, opening at maturity in five lanceolate-pointed laciniæ around a central round point, and forming a star (fig. 7 and 7 *b* enlarged).

This fruiting species is still more remarkable than the former. Groups of *sori* resembling round dots, fig. 8, are seen on the same piece of shale, but on

1. Haplopteris sp. nov. - Specimens of Butts N: 200 - 200a ... Species very similar to my H. sagittata. The sporanges are in ~~singly seated or with a triple~~ double row of separate fory bom upon racemes. They are oblong, linear, obtuse at both end, slightly enlarged and truncat at the point of attachment, one centimeter long, three millimeter broad. The rows of sori are sixteen on each side. The racemes are thick, alternately branchery branchlet supporting the sporanges very short, sporang nearly sessiles. I can not find any relation to this in the genera ferns of Hooker or Göppert under Genera has a branch of sporanges much like this one called A. 526, p. 103 Pl VIII A 9. fig 4.
2. In the lexicon Dictionnaire Colonger de Baillon 1706. There are 1 sporanges a capsules bags etc. with an elastic annules which surrounds them completely compare this.

406.

(1) Sphenopteris obtusiloba Ll & Lh. Three specimens of Lacoe Nos 726, 727, 732, agree exactly by the form obovate of the entire pinnule and also the venation to S. obtusiloba Ll & Lh. Ill 109. They show only fragments of ultimate pinnae with Ll figured. The midrib is not as thick as figured in Ll and the bantam leaflets are sometimes lobate. The secondary nerves are all from the midrib, numerous forking, the upper ones only one. The specimens may be different but the 732 shows the border slightly crenate or undulate crenate in some of the leaflets. The specimens are poor and obscure. may be S. lanceolata?

(2) Sphenopteris gracilis Brgt. I have numerous specimens from the Carboniferous of Alabama and also of Tilton which seen by the naked eyes appear to be referable to this species. The fragments of pinnae are bipinnatifid. Primary rachis narrow flexuous half round or half cylindrical (flattened) with a narrow flat border formed by the decurrent base of the divisions. Secondary rachis narrower but of the same character, primary divisions or pinnae oblique or nearly at right angles distant, alternate, lanceolate with 6–8 alternate pinnules also distant, oval or oblong ovate pinnately lobed, three or four lobes on each side oval oblong divided to near the midrib, entire or slightly undulate with a midrib either simple or forked near the upper part. The nervation of the leaflet is obscure. The pinnules appear to both sides of their base decurrent to the rachis but not forming border; but that is the form of the rachis as the base of the pinnule is exactly as figured by Brongniart Ill and I would not have any doubt about the identity of the species if the lobes of the pinnules were not mostly all entire half round while in the enlarged fig. of Brong. and they are marked bidentate (either slightly so) the species has a likeness to S. myrtilloides. Ill 126, however are there, three lobed mostly the lobes deeper more divided, the rachis much narrower and smooth. Fig 2 pl. 54 Ill more like it than any the pinnules of the plate suffering however by the character indicated. S. gracilis being a most variable species.

(3) Sphenopteris Hoeninghausi Brgt. I have two specimens from T. Coy. No 7 Lv 14 which appear represent this species. The fragments are small, only part of ultimate pinna. The pinnules are divided like them in Brgt fig and the lobes very irregularly; The venation is also the same. The tertiary rachis is deeply with an acute channel at the base and punctulate. It may belong to the following species, which from very numerous specimens referred formerly to S. Hoeninghausi.

(4) Sphenopteris (Calymmotheca) Stangeri Stur. From description and figure the numerous specimens recently smith and Aldrich from Alt. belong this species, rather than to S. Hoeninghausi. The characters of the rachis are the same. The primary rachis is large the main marked by scars of scales like those of a young branch of Lepidodendron, the secondary and tertiary rachis marked in the middle by a strong keeled nerve or costa, flattened on the borders and very minute. The tertiary rachis also keeled but less marked. The species differs however from this as also from S. Hoeninghausi as figured by Brgt by tertiary pinnae straight, nearly flexuous with pinnules longer, closer subdivided in 4 to 7 pairs of alternate lobes closer to each other but not to near the midrib but with the lobes more obtuse and more resembling Brgtd figure than that of Stur. The lobes are however closer than in S. Hoeninghausi which has the pinnules of the same length. It is extremely difficult to separate this species from S. Hoeninghausi. 2 spec. S. Stangeri.

1. Sphenopteris elegans Brgt. Sm. 4. is represented by some good specimens agreeing in character with Brongniart figure and description, the pinnules lobes and division being however smaller and shorter than in Brgt figure. Ma figure of this species is accurat. The rachis is grooved in the middle and margined as marked at the base of fig. 2 Pl. 53 of Brgt. distantly punctulate or smoth, somewhat rough. In worn specimens where the rachis is more evidently rough and the division of the pinnules shorter and more enlarged to the point, the specie seems to pass to Sph. Hoeninghausii with which it is mixed but which however is separated by its inflated pinnules or lobes. In this species they are flat without trace of nerves. The likeness of the form however to S. Hoeninghausii is very marked. I have kept a specimen S.M. 4a. The specimen next back is marked the same 4a.

2. Sphenopteris Chærophylloides Brgt. The small specimen N. 74 fig. Pl 23 see 3 appears really referable to the specie though the ultimat pinnæ are somewhat larger. But I have seen from Mansfield specimens 101 a Peterstein somewhat similar. Only with still larger pinnules lobe and a different nervation. (see 393 2. 1.)

3. Sphenopteris hymenophylloides, Gopp. SS 158 pl. sterile from Mores Lf. 1664 pl. fruity. rodeile from Maza creek. Each specimen only represent fragment of a pinna. Pinna linear, about three and an half centimeters broad, the pinnatifid primary division or ultimat pinnæ alternate at an open angle of divergence, short, the sterile ones 1 ½ cent. long lanceolate with a thick inflated rachis coming out also of the thick inflated rachis of the pinna. Pinnules alternate inflated in the middle, flattened on the borders rather pinnately divided into subopposite three to four lobes oblong oblate, diverging in the same degree as the pinnæ. pinnules nervid midrib thick decurrent at base dichotomous. branches simple or forking once. All the plant or the surface of the preserved parts covered with a thin coat of hairs rendering the surface rough, especially the under side as seen marked upon the stone after the abrasion of the thick epidermis. This also renders the veins somewhat indistinct. The parts figured (Pl. mixed) fig. 6. a. b. Fig 6 represents a specimen from Maza creek with fructification. The rachis is of the same character, only not thicker, at least the upper part only is seen and the surface is apparently smoth, the lobes are shorter less distantly marked than in the sterile part, more numerous and the sori disposed around in rows of four, at the end of a lateral vein. See fig. 6. a. b. Sometimes the division are short and the rows of sori are merely in one or two near the upper borders. Goppert and Weiss have figured this species sterile but from better specimens. Goppert in Gattung 304 Pl. 13 represent the species with the surface of the leaflets smoth and without trace of veins. Weiss in N. J. f. Min. Pl. 3. represent the surface as rather rough and with indistinct traces of veins. In both the broad rachis, the form of the pinnæ and pinnules the direction etc are the same. Goppert place this species in the Chærophylloides. The venation and fructification of the Peterstein or Gatherstein type of the other numerous species published with part. The thick hairy surface is remarked a number of species of this same type. The name has to be changed. in Gatherstein Hymenophylloides. Remark that the rachis of the fertile figures is thickened as with the surface villous. The surface is irregularly lined in the length and sometimes villous but not distinctly so as in the sterile specimen.

407a.

D. 1 Sphenopteris subalata, Sap. Weiss spec. Ap 1651, 1652, 1653 from Mazon creek by Avery. Fronds apparently of large size. Primary pinnæ bipinnatifid, long and linear or shorter and lanceolate, secondary pinnæ alternate, slightly oblique or turned upwards decurrent, and connected by the bar forming a narrow wing on the rachis pinnately 6-7 lobed, lobes alternate, turned upwards, divided to the middle dentate or crenate; medial nervule ascending to the top, lateral nervules pinnately diverging from it simple, two or three pairs passing up to the teeth of the lobes. In all its characters this form is a diminutive counterpart of the species figured by Brongniart as Pecopteris alata Foss. fl. p. 361. Pl CXXVIII. The secondary pinnæ are longer and narrower; the pinnules smaller, but the characters as described by Brongniart and especially by Schimper Tal. veg. 1 p. 411 are exactly the same. This form differs from Sphenopteris alata Guinier and Brgt by the pinnules or rather lobes less deeply parted, only to the middle, not even that and regularly crenate dentate at the top. The secondary pinnæ longer linear, much closer together etc.

D. 2 Sphenopteris Lesquereuxii Newb. Specimen Ap 1662 from Avery, Mazon creek shows curiously the color (red) of the specimens which I obtained from the Anthracite of Peoria. In this pinna which shows the upper part of a frond or of a pinnate branch, the ultimate pinnæ are about seven cent. long, inclined and also curved upward with eight to ten pairs of alternate pinnules entire slightly enlarged at the bar, undulate lobed attached by half their rounded bar to the rachis the others nearly entire attached by their whole bar, even joined together near the rachis or disconnected, show some of them imbricated on the borders. Generally the borders are undulate rarely entire the leaflets vary from fourteen millimeters long at the base of the pinnæ to 8 or 9 in the upper part; the pinnæ are therefore gradually narrowing toward the point which is destroyed in all the pinnæ of the specimen. The midrib of the leaflet is broad and distinct to near the obtuse top; the veinlets are very thin rarely discernable, distant, four to my mm, twice forked or dichotomous in the undulately lobed leaflets, forked once only in the entire pinnules, in the lowest pair only of the upper branch of the pinnæ sometimes once more.

3 Sphenopteris mixta Schp. Q specimen from Clinton N 108. represents it well enough and as I figured it in the plate of this vol. The pinnules are quite deeply undulate lobed as marked upon my figure, rather longer and not as enlarged at the bar where they are slightly narrowed and slightly decurrent at the base the petiole being slightly winged and not quite veined. see fig 8 a. where I have corrected it. The derme is thick and the veins very obsolete. The rachis are not diabrochous. Erase the fig. in pencil 7c thoroughly neivation. When the specimens are cleaned with the epidermis the nervation is brought nothing can be seen of it. see 406 b.2

4 Sphenopteris gracilis Schp. Fig 3 of the sample plate XV is represented by a large specimen N 105 b of Britt. It doesn't appear to be the same as Brongniart. Sp. the rachis is not naked or smooth but evidently rough punctulate. The secondary pinnæ are much longer, flexuous. The lobes extremely variable in form, as seen from my figure. In the long simple pinnæ, the pinnules or lobes are nearly round and crenulate in others whose rachis is broader the pinnules are shorter and pinnately lobed as in my figure. It is a most widely manifold species which should be figured in forms to parts and presented in its different aspects. Evidently this = S. nitida of which I have good plates

D. 5 Sphenopteris Gravenhorstii Brgt. A small specimen of Lacoe 365 seems referable to this species. The pinnules are narrower than and appear, the base is one at least more divided. The derme is thick wrinkled. Brgt. says nothing of the dreadful. Only a terete ultimate pinna is preserved. may be Sphenopteris. See the specimen figured from B. D. in the collection of ... College

the reverse. They apparently belong to the same species, and seem to have been detached before maturity from their pedicels, whose remains are still marked by dark lines, fig. 8, fig. 9, enlarged twice, and fig. 10, enlarged about ten times. In this last figure dark but absolute lines are seen, apparently showing the suture of walls. In the pinnately divided part of the frond, fig. 6, all the *sori* are opened, and their envelope is still attached to short pedicels, apparently placed opposite to each other. The details of the form of the sporanges are easily recognized, but those of their ramifications, or the point and mode of attachment of the *sori* are rendered indistinct by the superposition of the groups of sporanges. The specimen is on shale from Morris, and was contributed by Mr. Jos. Even.

Staphylopteris sagittatus, Sp. nov.

Pl. xiv, fig. 3 to 5.

This species has a bi-pinnate frond, as seen on a specimen from the shales of the coal at Morris, too large to be figured. The divisions are alternate; the thick secondary rachis is decurrent on the main stem, which is also broad and smooth. The double celled sporanges are linear, attached by their backs, and pressed against each other in horizontal rows. The enlarged pedicel of the sporange cells is, before maturity, apparently at least, folded in the middle, and both rows of sporanges are joined together by their back, forming in that state slightly scythe-shaped cylinders, obtuse at both ends, attached to the pedicel by a dorsal membrane, and marked all around by the ring-like outlines of sporanges (fig. 3*a*). More generally the sporange-cells are open side by side on each side of the dorsal support, and the sporanges appear then in two convex rows, fig. 4 and 5. In some specimens on concretions from Mazon creek, where small branches of this remarkable species are finely preserved, the *sori* or sporange bearing cells are deeply immersed in the stone, generally leaving around them an empty space, as seen in fig. 3*b* and 3*c*; they are thus isolated and their form is easily ascertained. No traces of leaflets have been seen in connection with this species, which has as yet been obtained only from Morris and from Mazon creek.

continued pp. 419c

Genus SPHENOPTERIS, Brgt., Ill. Geol. Rep., vol. ii, p. 435.

Sphenopteris scaberrima, Sp. nov.

Pl. xv, fig. 1 and 2.

Frond tripinnate, primary pinnæ lanceolate, curved downwards, flexuous; secondary divisions perpendicular to the verrucose, broad, round rachis, linear lanceolate pointed, one to two inches long, distinct and somewhat distant alternate; pinnules lanceolate acute, gradually diminishing to the point, distinct to the base, horizontal, irregularly cut on the borders or entire with borders irregularly expanding and undulating by crushed groups of sporanges or of scales; surface rugose, marked by round small convex points resembling small dots, produced by groups of sporanges placed on the lower surface. All the plant, even the thick, primary rachis, is covered with verrucose points, evidently indicating the base of scales, or hairs, with which the plant was covered, and which are still indistinctly seen on some part of the secondary branches. The frond of this species was evidently a large one, the pinnæ being more than six inches long.

The whole appearance of the plant is like that of some species of *Cheilanthes* of our time, especially of *Cheilanthes vestita*, Schwarz. The species should therefore be classed in the genus *Cheilantites*, Gopp. Nevertheless, the group of *sori* appears to cover the whole under surface of the leaflets, a position which is not similar to that of the *sori* of a *Cheilanthes*. On shales from Morris.

Sphenopteris gracilis, Brgt.

Pl. xv, fig. 3 to 6.

Frond bi or tripinnate; primary pinnæ or fronds triangular in outline, taper-pointed, slender; secondary pinnæ linear lanceolate, alternate and distant, open, curved upwards, flexu-

408c
12c Sphenopteris pennifolia Brgt? tp. 55. 44. ? a Sphenopteris is new. But it is more probable the mere skeleton of Neuropteris urgulo. showing merely broad deep medial and secondary veins. Bourgeauts species: Sphenopteris tenuifolia is still represented in U.S. 2116 mixed with Asthopteris - lacks the veins.

However some of the pinnules appear entire, undivided and therefore those which are divided may be also mere skeletons of leaves. If Bourgeau says that the details of his enlarged figures are not quite certain, I think that we have in this specimen the exact species of Brgt, if agree by the characters indicated by the author.

D 4c Sphenopteris (Neuropteris) ovalata Brgt with 467 there is in a Rocks of Mayo creek a very fine well marked specimen of this species no difference. See 4c

A1. Sphenopteris flexuosa, ? Gutb. Frond bipinnatifid. pinna triangular or broadly lanceolate in outline short, primary and secondary rachis alate, flexuous, pinnule short, alternate distant, divaricate (very widely divergent) deeply pinnately lobed, segment linear truncate and slightly enlarged at top or obtuse, the lowest cuneate bifid. This species matched by three specimen from the Woodworth mine Helena. Ala, Jm. 27. A1 33 & 34 agree exactly with the description in Schp. veg. Pal. 1 p. 389. It however differs from Gutbier's fig. 01 this species in Ventenii pl 33. pl. IV fig 3. (not in my plate) pl IV fig 2 by the segment longer, obtuse or slightly enlarged and truncate at the top. Gutbier does not mention neither does it figure the alate rachis. It also remarks that the segments are dentate at the top a character which is not remarked in our too small specimen. It is somewhat like Sphenopteris delicatula Brgt. p 185 pl 58 fig 4 & 4c. differs by the broader segments especially the undulat rachis etc. But the parenchyma of the alat borders is here as Brgt. remarks of this species tenuissima reticulate. It has also some affinity to Trichomanites gregarythyllus, Gopp. Nov. pl 21 XLIV fig 2.

2c 2 Sphenopteris spec. or odontopteris. No 21 a short frond or pinna sorted from the top of a short broad rachis 2 cent. long 6 millim broad in two lanceolate pinna primary pinna short 4 to 5 cent long 2 1/2 to 3 cent. broad at the base, rapidly decreasing by the shortening of the secondary pinna into a small terminal obtuse pinnule ~~with large pinna~~ with a thrill flexuous rachis half round not winged; secondary pinna in right angle to the rachis short, the lowest 2 cent long rapidly decreasing in length cuneiform alternate obtuse or obtusely pointed oblong short pinnules apparently slightly decurring a rather connected at or near their base with a middle nerve obscurely defined. The substance of the leaflets is thick coriaceous. Hay in the outline somewhat like the Odontopteris Böhmii Gutb. but the character are obscure, even the form of the pinnules is not quite distinct and the nervation totally obsolet ~~It is also remarkable that the secondary pinnae base decurrent a peculiarity of the upper part of the leaves remarkable that of Alethopteris Serlii Gutbier.~~

D 4c Sphenopteris crislata ~~Brgt~~ the above specimen is N. 58 in my collection agreeing with Brgt figure and description except that the lobes are crenate not dentate. The specimen has fructifying similar to the fructify figure in Geinitz. But this specimen does not agree well with Geinitz figure of the Neuropteris as it owns the lobes are bluntly dentate or crenate. See description p 12c. 1.

1 Sphenopteris Mississippiensis Pl XXIII This species is very closely allied to S. linearis Brgt. It differs essentially by the rachis, both secondary and tertiary distinctly alate, the much elongated barbate pinnæ and the pinnules evidently decurring and forming wing along the rachis, by the much shorter, more erect less deeply divided and by the nervation, the veins being all equal, parallel and more numerous. The ultimate pinnæ of S. linearis Brgt. are remarkably lobed, 2 lines long short, two and an half centimeters long with four pairs of alternate pinnules on the terminal one, their form of the pinnæ is lanceolate. In Sph. linearis the linear narrower longer ultimate pinnæ are five to 7 cent. long, with 10 to 12 pairs of pinnules more erect and more deeply lobate, with lobes divided in two obtuse points and not flat. The two lower pairs of pinnules are very small, scarcely two millimeters long and a broad while there above are 15 millim long and six to eight millim broad at the base. This species is indeed remarkable and distinct as much by the characters of it leaves as by its nervation. see p. 409 b 2.

2 Sphenopteris chærophylloides Brgt. I have only figured a small specimen - Pl XXIII c, f. 3. from Dr Britts which shows the essential characters of form of pinnules lobes and the nervation. See the description of the large specimen p 408 c (3) made it as it is and remark that the specimen is too large for figure. (This is not Charophyllites Cat 8 of map 15, see p 409 a 3)

3 Sphenopteris rigida Brgt. Sta. 80. The specimen from Manistee seem referable to the species of Brgt. though also somewhat related to what I have considered as the species in Rep. 4 p 435 Pl XXXIX fig 5 & 6 which, according to Schimper is not S. rigida Brgt. In this specimen there is only a branch, ultimate pinnæ linear-lanceolate in outline pinnately lobate, the lobes 9-10 pairs alternate upon a nearly at right angle to the apparently smooth, narrowly winged rachis; pinnæ lobes lobed in round or obtuse divisions, separated to the middle, three pairs on each side with a broad very obtuse half round pinnule. The primary lobes or pinnules become gradually shorter towards the top of the pinna, their division shorter and more confluent the upper pinnules being therefore merely oblong obtuse crenate in the border. The lower ones are 6 to 7 millim. long the upper ones only two. The surface of the last division or lobe is indistinctly marked by short veins apparently of the same type as Sphenopteris obtusiloba but the epidermis is somewhat thick rendering the veins obsolete and where it is present effacing them altogether being covered with minute points very close to each others or hairs as remarked in Brgt. fig. enlarged part but not in the description for or the contrary for the author comparing it to S. Hoenninghausii says that it differs from it by the (absence de tout écaille ou poil) while there are distinctly seen in the specimen which is then more like the species of Vol II of the Ill. Report. which Schimper Pal. Veg. p. 382 names Sphenopteris pinnata. In this pinna however the rachis is broader and the pinnules not flexuous

= Pecopteris callosa Brgt. Compare Weiss Pl. 1 fig 1 Neuropteris cordata-ovata

1. Pteropteris stenorrachis? This species is represented by specimen No. 285 which I considered as P. stenorrhachys Brgt. It presents a lanceolately dissected pinna with a strong comparatively broad rachis, whose primary divisions are perpendicular to it, somewhat distant, linear, about one inch long, bearing alternate (rare opposite) short pinnules two to four millimetres long, pinnatifid in three equal round lobes or rather undulations (not deep) on each side and obtuse at top, decurrent on a broad straight rachis, and connected at base. Medial nerve undulat & each division primary forking each branch going into one of the lobes and forking once in the course which is slightly flexuous. It resembles Pteropteris miqla of this Coll. But the secondary rachis is there, not at all flexuous, the leaflets broader not pointed, the main rachis isolated on the borders flat in the middle &c. It may be a variety. But the general appearance is different. 12.10.71. Other specimen for ex: No. 544 show the secondary divisions of the rachis of the same kind as No. 285 straight and comparatively thick and irregular leaflets like those of P. miqla. It may be therefore a variety of this species. Compare Rem. This species after reexamination is referable to P. callosa Brgt. Ill. Geol. Rep. Vol 2 p. 35 fig 1 & 2 p. 442. The species is very variable in the size and form of the leaflets which are generally undulately lobed on the borders but sometimes entire. By the thickness of the rachis &c. the species is far different from Pteropteris miqla to whom it resembles only by the form of its leaflets. In specimen No. 541 show the species fructifying. The leaflets are entirely covered with round sori whose relative position can not be ascertained; they entirely cover the surface. 12.10.71. See Ill. Geol. Rep. Vol. 2 p. 442 fig. 2.

See p. 407a 3

D

D.

D. 5

compare remarks to Callipteris Gleicheni von Brgt. Tableau Genres p. 15 Gleichenia.

See 407a R.

ous, bearing alternate divisions, cordate, lanceolate in outline, deeply cut on each side in three to five irregular obtuse or pointed lobes, as seen in fig. 4, 5, 6, enlarged; medial vein somewhat inflated like its pinnate divisions, which branch once or twice to the borders, according to the size of the lobes.

The surface of the leaflets is quite smooth. By its slender, half round secondary and tertiary rachis, and the general form of the pinnæ and of the divisions, our species agrees well enough with that published by Brongniart, Veg-Foss., p. 197, pl. 154, fig. 2. But the author describes and figures the lobes of the pinnules as being more regular, longer, regularly tridentate at the point, while those of our specimens are always either more or less irregularly cut, or entire, and also either pointed or obtuse. The difference in the form and size of the lobes of the pinnules of the same pinnæ, indicate for this species, as seen from our fig. 4, 5 and 6, a great disposition to vary, and the more essential characters being identical, I can but consider the American specimens as representing the same species as that of Prof. Brongniart.

It is found in fine large specimens on the shales over the coal at Morris.

Sphenopteris mixta, Schp. Pal. Veg., p. 382.

Sphenopteris sinuosa Lesqx, ined.

Pl. xv, fig. 7 and 8.

This species is the same which, from incomplete specimens, was in the second volume of this Report, page 435, considered as doubtfully referable to *Sphenopteris rigida*, Brgt. It has a tripinnate or polypinnate frond, the specimens being covered with numerous secondary pinnæ, of which one only is figured here. Pinnæ branching at a right angle from a broad winged smooth rachis, bearing alternate lanceolate secondary divisions, with a half round comparatively broad and regularly sinuous rachis. The pinnules obliquely attached upon each of its convex flexures are oval, lanceolate pointed, regularly divided on each side into three to five half round lobes. The medial vein which, like its divisions, is thin and somewhat obscure, alternately branches into each lobe of the pinnules, the branches forking above the middle. The epidermis is thick, the surface convex and somewhat rough. This species appears essentially distinct from *Sphenotopteris rigida*, Brgt., by its broad winged rachis, the form of the pinnules and of their divisions, the slightly rough surface, etc.; nevertheless there may

be some error of description or of illustration of the European species, which is marked as having its surface entirely smooth, while the figure shows it covered with points or rugose.

Abundant in the shales of the coal at Morris.

SPHENOPTERIS TRIFOLIATA, Brgt. Veg. Foss., p. 202.

Pl. 53, fig. 3.

In the shales of Colchester; found by Prof. A. H. Worthen.

SPHENOPTERIS ELEGANS, Brgt. Veg. Foss., p. 172.

Pl. 53, fig. 1 and 2.

Two fine specimens of this species have been obtained from the concretions of Mazon creek; by Mr. M. S. Hall.

GENUS HYMENOPHYLLITES, Gopp and auct. Ill. Geol. Rep., vol. ii, p. 436.

In preserving this genus, with its characters too vaguely defined as it is in vol. 2 of this Report, p. 436, it would be advisable to subdivide it as follows:

§ 1. *Hymenophyllites* proper, containing species with a generally membranaceous delicate frond, pinnately divided, the primary divisions alternate or dichotomous, decurrent on the rachis and ultimate lobes linear obtuse, either simple alternate or irregularly divided; nerves percurrent pinnately branching, ascending, simple in each lobe. This section contains *Hymenophyllites* and *Trichomanites*, Gopp.

§ 2. *Aphlebia*, including species with fronds of various sizes and forms, generally with a broad rachis and more or less irregularly divided, the divisions rather dichotomous or pinnatifid, entire or variously laciniate lobed, the lobes sometimes enlarged and recurved; veins parallel and numerous from the base of the fronds, dividing in fascicles from the rachis in each primary division, and passing by subdividing, as simple veinlets to the point of each lobe. To this section are referable the genera *Aphlebia*, *Schizopteris*, *Rhodea*, *Pachyphyllum*, etc. auct.*

*W. P. Shimper, in Pal. Veg., makes for this section a new genus, *Rhacophyllum*.

see 1b below

see 1. III c, 3 b.

see 1. III c, 3 b.

D 2c

D. 16. ~~Dryopteris obtusiloba~~ Polystichum obtusilobum Presl. This species is figured by Brong. pl 37 fig 1 to 4 and by Goppert Genera Cic 324 pl 14 fs 5-6 is represented by a few fine but good specimens from Alabama S.M 24 The specimens are small just like those figured by the European authors and with exactly the same characters; leaflets slightly decurring, narrow rachis scarcely winged &c. Goppert in Genera loc. cit. p 74 says that it is very common in the coal of Silesia and has fronds 1 to 2 feet long and rachis one inch thick. But he does not indicate any character different from Brongniart description.

D ~~Aspidium~~ Polystichum ~~spinosa~~ ~~Presl Tab. Sp.~~ latifolia a. Sp. nov. (see plat) SM. 116. is much like the forme S. latifolia. Tripinnate. Primary rachis broad, 1 centimeter. Primary pinnae very open like the secondary ones, large lanceolate in outline; secondary pinnae alternate, at an open angle of divergence even in right angle or reflexed, linear-lanceolate bearing distant alternate pinnules, ~~the lowest~~ all decurrent at base on a winged rachis, the lowest one broader irregularly pinnately lobed, with the lower lobe enlarged, the upper one equally lobed with five oblong obtuse equal lobes and a terminal more acute one, upper pinnules entire lanceolate obtuse. The division of the pinnules and of the pinnae also is apparently the same as in Sp. latifolia a. The general characters of form and nervation are also of the same Sp. There is only an essential difference in the broadly winged rachis, the marginal membrane being always broader than the half rounded rachis and the pinnules being also and all double in size of those of S. latifolia. In the specimen as figured the part as shows the upper surface of the leaf, polished and the veins inflated. All the

* The value of the species is more about the specimen D
This is not what we see on the surface - correct with the specimens
Many forms are figured when the veins are inflated. I think it is good

410c

1 Rhacopteris, Schp. — See description of the Genus Schp. Vegetal. I p. 481

D2. Rhacopteris elegans, Schp. (Rh.) Asplenites elegans Rh. Sphenopteris asplenites Gein. Comparing the specimen sent by Southwell from the Dalcarbonferous a Drecarbonferous 1, Rh with fig. of Geinitz Verst. d. XVIII (17) Pl XXIV, fig 6 and with Schimper description in Pal. Pal. p. 482, I can not see any difference. Rachis flat, grooved in the middle. Pond pinnat; pinnæ lineal-lanceolat long, pinnules alternate fixed to the border of the rachis, not decurrent erect or open erect, close, contiguous by the borders, rhomboidal oblong narrowed to the base, more or less deeply cut lobat (dissectes) veins dichotomous flabellat from the base, straight, 2 or three in each lateral lobes. Schimper says that the lateral lobes are merely crenated (binervules) and bidentat at the apex, and the lobe terminal with three veinlets and three dentat. — In specimen of Southwell is wanished and the point of the lobes not very distinct. They appear generally as having three veinlet and three teeth at the apex of the lateral and also of the terminal lobes. Geinitz descriptions p. 17, agree better with the specimen of Rh. I have no doubt that it represent the same species. represent apparently

D. 3 l. Sphenopteris ~~trifoliata (Var. divergens) irregularis~~ Brg. Specimen N 94 b of De Butts ~~is a~~ ~~exactly~~ though small specimen of this species; in this the leaflets are oblong obtuse, pinnately once or twice lobed with round obtuse lobes, the lower lobe not cut or notched but equal to the middle one. In this the nervation is distinct enough and like that of S. latifolia. The other specimen N 94 pass to pinnules also oblong obtuse ~~to~~ pinnately lobulated with broad obtuse lobes, the lower one broader but not notched and no trace or slightly any trace of nervation visible and exactly like S. trifoliata Brg. as figured Pl 53, fig. 3 & 3a. I believe that this should rather be referred to S. trifoliata than S. obtusiloba. These two species are very like this one. In this form the lobes are not as deeply parted as in Brongniart's figure. See C. M. p. 39 and 40 Fig. 7 of Pl XXIII ee. represent the specimen 94 which agree exactly with Brongniart fig. 2 description of S. trifoliata in his Pl. 53 f. 3 & 3a. Remark however that this (according to Schimper) is not the true S. trifoliata of Artis which indeed differs much and which has not been seen as yet in American specimen. N 94 b of De Butts is the same species and form as S. M. 24 Pl XXIII e. f. g. 6. as for the nervation it is however obsolet the veins being replaced with a covering of coal and obsolet and other visible and of the same character as in the last figure.

We have therefore S. trifoliata Brg. not Artis and fig 6 is Sphenopteris obtusiloba a latifolia. Brg. is the obtuse lobe S. trifoliata numerous specimen of Prof. Smith for Alabama represent the species Sph. obtusiloba with whole small pinnules and its nervation a S. trifoliata with pinnules exactly like Brongniart fig 3 but with the nervation of fig 2 a which is S. trifoliata. These specimens

#1 Both these specimens 1649 & 1670 represent the same species apparently a form of Pecopteris Miltoni, Byd. 1650 & differs

1 Sphenopteris species nova. 2 ex 24 1649 & (1650?) from Mazon Creek represent a bipinnatifid pinna with lobes or pinnules decurrent and joining a narrow wing along the main rachis. lobes oblong or rather ultimate pinnae oblong lanceolate abruptly cut at the top, divided in alternate lobes or pinnules 6 to 7 pairs ovate or oblong decurrent to the broad flat midrib of the pinna, joined near the base, three or four dentate on the borders; veins thrice parallel, decurrent to the base of the pinnule dichotomous, the middle somewhat more distinct and dichotomous alternately. The nervation is somewhat like that of Pecopteris nervosa, but the mid rib less distinct, sometimes not at all and the borders of the lobes are evidently crenulate. 24 1670 is more obscure and it is not certain if it represent the same species.

2 Sphenopteris minuta a sp. nov. 24 1674 & 75 counterpart from Mazon Creek (see note at top.) a small pinna four centimeters long only bipinnatifid. Pinnules alternate 12 - 15 pairs oblong obtuse zigzagging rachis separated or distinct, enlarged and joined at base, lanceolate lobate with three pairs of alternate obtuse short lobes on each side an a terminal one obtusely pointed. much like fig. 5 of Pl. 39 of the Ill. Rep. Vol 2. but the pinnules slightly narrower, the lobes more distinct, & the terminal one slightly longer. I can not be separated however. The nervation is distinct upon some of the lobes of the pinnules whose veins inflated appear to have had the surface of the epidermis erased and destroyed. It is marked upon my figure of Pl 39. the middle nervi alternately branching each branch entering a lob and dividing dichotomously in two or three divergent veinlets according to the upper or lower position of the lobes. There is in the specimens of J. F. Southwell a very small fragment Pl 4 which is part of an ultimate pinna with five pinnules each side, on one side evidently lobate; three obtuse though short lobes each side of the mid rib; the pinnules on the other side shorter entire enlarged at the base with none or only one lobe each side.

3 Sphenopteris (Trophylopteris sp nov) (Thus apparently identical with Trophylopteris ? ex Pl. 23 fig 7 & 8 Sm?) Cremopteris microphylla? from Haddock Coal, S.S.68. of the Museum a fine specimen of the species agreeing exactly with that figured as above from Alabama. The form of the pinnules is the same. From the lobes at the base, they become entire, merely enlarged in the middle toward the point of the pinna. They are decurrent upon the ultimate rachis which is thus alate & narrow ly margined. The primary rachis is marked as that of the plate by short cross wrinkle depressions which upon the coal appear both in small tubercles of the stem are as marked upon this figure but not thence a more closely placed [illegible] at least 16 veins per mill meters from the borders to the middle. A good fine species. Trophylopteris. Trophylopteris to Sphenopteris (Crepin.) free of drainable

4 Sphenopteris placida (Crepin.) I find this species in poor specimens thence I recognizable in Crepin Description etc. a small pamphlet in my coal pamphlet This plant is in Belgium from the Flammites of Condroz Devonian superieure where Palaeopteris hibernica & Chondrites antiquus have been found. He finds there also a Palaeophiton condruzorum. you remember Leidy & Dawson I believe in have a Flammula radiata plus or more minutely striate & thin lobate. This description could apply to the stems where these remains have been found by Ashburner with Lepidostrobus Stems see catalogue Pa. 23. The specimen is broken and small amount only can be seen. The Rachis is thick, finely striate branching in right angle as in fig 2 of Crepin & the pinnules or lobes divided as in fig 3. The stem or rachis in Crepin's drawing is also striate. All seems identical. This rachis is equally striate or lineat in its smallest and largest branch Pa 24 has narrow rachis from less than one to two millimeters broad quite flat, nothing like grass blade. Pa 310 has in the upper side fragments of stems referable to this and on the reverse a large apparently basilar section of a frond. This nearly 6 cent broad towards the base and has positively the same characters as the Rachis Pa 23.

§ 3. *Schizopteris* proper, to which belong the species with a frond generally laciniate, or cut in linear erect or curved divisions, sometimes enlarged at the top, marked with thin parallel veins ascending from the base of the frond to the top of the lobes without branching, being split in fascicles with the divisions. To this section belong merely the genus *Schizopteris*, as characterized by Prof. Brongniart for his *Schizopteris anomala*.

It is difficult to separate these sections in genera by reliable and permanent characters. Some of the species which are considered as *Schizopteris* by authors, as *Schizopteris adnascens*, Ll. and Hutt, for example, have the nervation and a mode of division of their fronds similar to those of some *Hymenophyllites*, while species referable to this last genus have, with a regular mode of division a nervation by disconnected fascicles of veins, like species of *Aphlebia* and *Schizopteris*. This is the case with our *Hymenophyllites splendens*. The plants of the two last divisions are little known, their apparently soft tissue having often been destroyed by maceration. I have described and figured here some remarkable forms, especially from the concretions of Mazon creek, whose study may throw some light upon the nature and conformation of these singular vegetables.

§ 1. Hymenophyllites (proper).

Hymenophyllites alatus, Brgt.

Veg. foss., p. 180, Pl. 48, fig. 4.

This species is mentioned in the Ill. Geol. Rep., vol. ii, p. 437, as presenting some characters at variance with the European one. Good specimens of it from the concretions of Mazon creek, show it to be identical.

Hymenophyllites tridactylites, Brgt.

Veg. foss., p. 181, Pl. 50.

Good specimens of this fine species have been lately procured from the roof shales of the coal at Morris, by Mr. S. S. Strong.

Hymenophyllites trichomanoides, Brgt.

Veg. foss, p. 182, Pl. 48, fig. 3.

A small specimen from the same place as the former.

Hymenophyllites myriophyllum, Brgt.

Veg. foss., p. 184, Pl. 55, fig. 2

The straight, strong main rachis and its branches, like the form and divisions of the leaflets, entirely agree with the author's description and figures of this species. Some of the terminal divisions of the pinnules appear on our specimen as slightly inflated at the point. It is not possible to see whether this swelling is caused by fructification, or by the remains of some part of the half destroyed epidermis.

Roof shales of the coal at Morris, contributed by Mr. S. S. Strong.

Hymenophyllites Schlotheimii, Brgt.

Veg., foss., p. 193, Pl. 51.

This species should be placed in its natural order after *Hymenophyllites tridactylites*, Brgt., but our specimen, a very fine one, is described here from the remarkable likeness of its divisions when deprived of their epidermis, with the former species. Except a few entire leaflets which have preserved their integral form, the whole specimen represents merely the veins and their divisions, without any substance of the leaflets attached to them; in that state, the species could easily be confounded with the former or considered as a new one.

From the same place as the former, and due also to the successful researches of Mr. S. S. Strong.

Hymenophyllites delicatulus, Brgt.

Veg. foss., p. 185, Pl. 58, fig. 4.

This species, also from the shales of Morris, could be admitted, by some of its parts deprived of their epidermis, as identical with that of the same name of Sternberg, which has been considered as a *Cheilanthes* by Goppert. The thin membranaceous substance of the pinnules in our *Hymenophyllites*, is generally partly or totally effaced by maceration.

1. Sphenopteris trudactylites Pryl. Pl. XXIII ee fig 4 & 5 fruct. fig. The species is very common in the low coal. We have it from the Sandstone in Mercer Co. Ills. nut conglomerate and also in the specimens of Worthen & Cox. The specimen figured here are from Butler, Clinton Co. 63 & 63a. To Brongniart's description add that of the fructifying part. As in the sterile frond the rachis remarkable especially in the large rachis of 2nd order & capacity visible in those of 2nd & 3rd order are minutely pendate comparatively thick, the pinnules divided in oblong lobes marked by an agglomeration of small round spores, closely grouped and pressed upon one another as marked in the enlarged figure a. The species is therefore referable to the cryptogrammeæ. as seen in Hooker Pl. III fig 29. The spores are often single sometimes 2. 3. etc. being very irregular. (see Pl. III fig 6a & 6c where the lobes of pinnule remain and the rachis is naked especially) from that the enlarged fig 6a & 6c where the lobes of pinnule remain and the rachis is naked ~~of the fructification~~ generally ~~remained by the fructification~~ (see p. 412 c. (2)) ~~but also sterile. Impressions of the pinnule on most of the rachis~~

2. Sphenopteris Worthii! Sp. nov. Clinton Mo. N 99. 100. 101. (N 71?) Bipinnately divided pinnæ linear or linear lanceolate with a thick rigid or squarrose rachis; secondary pinnæ linear lanceolate, gradually tapering to a small truncate or bidentate leaflet, open nearly at right angle to the rachis, short, 1½ to 3 centimeters long and narrow, 6 to seven millimeters broad toward the base, pinnules short, half round, irregularly five to seven dentate on the border, separated to near the base when they join in decurring open, nearly in right angle to the midrib; nerve alternately dichotomous forthem three or four times in ascending, the divisions excurrent to the point of the teeth. In specimen N 99. the surface of the leaflets is rough without trace of veins, marked with round flat dots, irregular in their distribution more marked on line on both sides of the secondary rachis or mid rib and apparently representing fruit dots. (2) (The name applies only to the specimen) The fertile pinnæ are mixed upon same primary pinnæ with sterile ones even some pinnules of a same secondary pinnæ appear fertile and others sterile, them showing distinctly the nervation. In some pinnules where the coating of scaly surface is casually removed the points or spores appear placed just upon the point of forking of the veins. Sp. N 71. appears to belong to this species. The leaflet however are less distinctly dentate on the borders; the midrib or secondary is much thinner, flexuous and the primary one is also more narrower flexuous and without any trace of scales or dots. The surface of the leaflets is also smooth. This may be the sterile part of the species. This seems related by form and characters of fructification to Sph. trudactylites: Other description of Sph. pentha to Sphenopteris mapleta as figured pl 23 dol.

3 Hymenophyllum Vernii! Schp. Veg. Gal. Pl XXVIII figs 4-7 A specimen N 1641 from Major Creek represents this species. It agrees exactly with Schimpers figure. It is however broken & the form of the fructifying leaflets and the division is as in Schimpers ~~more~~ more compact in description of H. inflatum.

412c.

N. 105 of Butts All these = S. mixta.

1. Sphenopteris (Feuzteria) Cristata Brgt. Pinnules deeply divided, primary rachis with secondary pinnae. Length flat, narrowly margined by the decurrent pinnules. Here nearly at right angle or slightly oblique are very linear gradually tapering towards the point, in this segment they are 9 cent. long, two centimeters broad towards the base, by the slightly decrease at the base only three millimeters broad towards the top, where they are flexuous or flagelliform with a convex rachis pinnulets as the main one; pinnae divided in alternate short lobes open or slightly turned upward, linear oblong obtuse, narrowed at the base of the upper ones decurrent at the other divided in three to five alternate lobes which are short, rodentate or rather three crenate, the teeth being obtuse perhaps on account of the border which appears to be reflexed. The pinnules nerves are pennate, one for each pinnules, the nervelle tripod. This segment is corresponding entirely with Brongniart description and figure, he however does not mention the pinnulate rachis the secondary rachis are stronger than marked in Brgt. and the teeth are more obtuse. Rem. This can not be S. cristata Brgt. as the pinnules are decurrent and forming borders along the rachis but this specimen appears still referable to that formerly called S. gracilis - see 407a 4th. Brongniart describes the pinnules and figures them as narrowed at the base on both sides. Thus - I have received still another specimen with the same characters as indicated above which can not be considered as S. Cristata. The lateral secondary rachis are much thicker than in Brongniart species all this as Sphenopteris mixta as figured in my plate. It may be different from what Schimper has taken for the species but it is this as in my plate.

D 2. Sphenopteris irregularis, Pl. Specimen N. 25 of Butts is a splendid specimen of this species. It has the lobes or leaflet of the same size as figured by Geinitz, Pl. 23. also of the same form and character than S. trifoliata Brgt. with leaflets varying from one to eight pairs in number generally three, sometimes only one or six &c. trifoliate Brgt. The nervelet is very often on account of a thick coating of coaly matter forming the surface of the leaflet which were evidently covered with short hairs or villosa. With the leaflet whereby this coating is destroyed the nervation is exactly as marked in Geinitz in his enlarged fig. 4 a. with the terminal pinnules pointed. This specimen exactly represent upon the same pinnae Sph. irregularis as described by Schimper & S. trifoliata of Brgt.

D 3 Sphenopteris acuta Brgt. Spec. 111 of Butts, a small piece in Sandstone represents perfectly this species as figured by Brgt. and Schimper description. This species is very near S. latifolia of Brgt which is upon specimens from the Whetstone quarry of Cap and. have the same appearance and characters as this being merely slightly more obtuse to characterized a specimen the latter being merely slightly more obtuse than the figured specimen

D 4. Hymenophyllites Stipulatus Gutt. see specim. Em. 1 from St Clair will of his a small fructified brand and seems to represent this species there is however no pinnulate rachis and the pinnules are not seen. Can not be described without figure

D. 5 [illegible] specimen [illegible] show the same pinnules have [illegible] deep sinuses sometimes [illegible] nearly distant [illegible] the specimen in question is certainly a good one. Upper leaflets marked [illegible] similar to figure. But there are marked [illegible] [illegible] [illegible]

with Brgt. fig. & description as those of Morris. The fragment or specimen represents part of a bipinnate frond & measures 5 to 6 cent. long and as broad, broken at the top and the base. Primary rachis rigid, not alate or winged 1½ mill broad. pinnæ about in right angle or slightly oblique variable in length from 3 to 3½ cent. linear lanceolate, 12 mill broad at base gradually & narrowed to a small obtuse terminal leaflet. bearing 8–12 pairs of alternate pinnules, oval in outline sessile or at the slightly decurrent and joined at the base by a narrow margin. pinnately three or four lobed: lobes short obtuse entire midrib pinnately disposed, each division entering one of the lobes forking alternately twice & thrice in the superior larger lobes. I can not see any difference by which this species could be separated from G. Murrayana except by the narrowly decurrent base of the pinnules which are thereby joined to each other at the base. If the pinnules which are thereby joined & each other at the base. If could be figured and described as Pseudo Murrayana or another new species. The veins and veinlets are very distinct. See Schimper Vol. III p. 411. see also this Vol. p. 419c 2.

Sphenopteris (Diplothmema) subgeniculata Stur. Two specimens from Aldrich N° 57 represent apparently this species as figured by Stur pl XII fig. 10. The largest specimen is tripinnately divided. Primary rachis rigid, straight, not flexuous except slightly so near top, 15 cent long 6 mill. broad at the base scarcely two mill broad at the top where it is broken, flat irregularly obscurely ribbed. Primary pinnæ in right angle long, linear, distant, the lowest 6 cent where it is broken, more or less flexuous in turning to the base of the pinnules or alternate direction. Pinnules alternate 5 to 6 mill in distant, free or adnate at the base alternately, the lowest pinnately divided; division or lobes 4 or even such the lowest forking sometimes the upper ones twice, the terminal simple. all the divisions or lobes linear obtuse, either entire or the lowest one sometimes emarginate or forking at the top. The secondary rachis is 1 mill. broad, transient in the middle; the base of the tertiary division is of the same width, slightly dilated at the top (in both) the gradeneury all the divisions inflated in the middle by one (single nerve) nerve opaque or rather wavy and granulose. — This form is slightly larger than that figured 10 of Pl 12 of Stur; all the other figures represent the species with narrower nearly filiform divisions. All the lobes are distinctly obtuse. The pinnæ appear to have been large and broadly lanceolate. The part figured is 12 cent broad. all the primary pinnæ exactly in right angle to the common rachis while the secondary ones & pinnules are more or less inclined upwards. The secondary rachis is flexuous. Compare the specimen with the figure 6 & 7 of pl. 61. (not described as N°) and correct description.

2 Sphenopteris pentaphylla Roem. Foss. Pl. XXXI fig. 4. Ms 27 & Ms 223a represent finely this species in two good specimens. The author p. 181 says much of the nervation that it is indistinct. The substance is thick, coriaceous, the epidermis rough. Even when developed the veins are rarely seen, their passing from the base to near the point of the pinnules forking in the middle, three apparently from the rachis, not joined at their base most decurrent, in the figure they appear joined. But this is marked only in the lowest pinnæ lobes; in the middle one they join the rachis. The pinnules are cut nearly to the base in two or more generally three pairs of nearest lobes disjoined near the base but often connivent or even imbricate with the rachis; pinnules 6 to 8 mill long obliquely

D. 1 H. splendens ? var. I have specimens from Clinton under N. 92 which have all the characters and the appearance of the species. The lobes are only slightly more obtuse dentate and the derma is rough not polished through a thick and an easily detached as in the specimens from Morris. It appears to be scaly, the rachis also. These are flat slightly tumid or inflated in the middle. This is exactly a type of division of fronds like Hymenophyllites (Aphlebia). The primary rachis is thick but flat. In one of the specimens which should be figured, it is four to five millimeters broad finely veined by parallel nerves which separate in an acute angle of divergence from the main rachis to form alternate branches or pinnae which are very oblique. These are alternately divided in pinnules formed by a broad sinus and nearly in right angle to it, oblong in outline, three to five alternately lobed the lobes rarely entire mostly bi or tri obtuse short lobed very obtuse marked in the middle by an undivided nerve with simple division passing into each lobe.

D. 2. Hymenophyllites expansus, sp. nov. Species represented by N. 392 of Lacoe collection a mere fragment figured. The nerves are very thick or rather broad, coherent, resembling stems and branches, dichotomously divided, all the divisions followed in their length by broad expansions of foliaceous tissue terminating in a point at the top of the veins or above the end of the ultimate divisions. The figure represents exactly the specimen. I do not find anything to which this might be compared but Trichomanes foliiformis Gutt. which has a very distant relation indeed, the surface of the foliaceous expansion being smooth in our specimens and punctate as that of Guttier and also the small specimen figured by Geinitz Pl XXIV fig 13 a Hymenophyllites furcatus, a mere branchlet which can not be referable to this species and differs from ~~xxx~~ as this here described by its narrow flagellate lobes.

D

from 413:2 - inclined upwards; the rachis of the pinnules ~~xxxxxxxx~~ broad and flat, decurrent towards the base, the lobes also inclined upwards very obtuse half round with a tendency to decurring to the point of connexion. The segment of primary pinnae appear lanceolate, the lateral or secondary pinnae about four centimeters gradually narrower in the upper part where the pinnules become five lobed, then three lobed, the penultimate and ultimate lateral, broadly oval obtuse, with one slight mucronate lobe on the lower side and the broad secondary rachis terminating the pinnae continuing naked 1 mill broad & millim long to an abruptly rounded apex, as in the top of the pinnae of Sphenopteris species to which this species is closely allied by its general character, thick epidermis and mode of division. This goes to the Dictyothecium of Stur.

HYMENOPHYLLITES TENUIFOLIUS, Brgt.

Veg. foss., p. 190, Pl. 48, fig. 1.

Well characterized by its straight broad rachis, the position of the pinnules, the narrow lobes, etc. The epidermis is also partly destroyed.

Roof shales at Morris; a small specimen.

All the foregoing species of *Hymenophyllites* are described as *Sphenopteris* by the author.

HYMENOPHYLLITES SPLENDENS, Sp. nov.

Pl. xix, fig. 2*a* and 2*b*.

FROND tripinnatifid; primary pinnæ at a right angle to the flattened main rachis, broadly lanceolate in outline; secondary pinnæ alternate, narrowly ovate-lanceolate, oblique decurrent on the flexuous alate rachis, alternately two or three lobed on each side, the lobes divided in two or three lanceolate, somewhat obtuse teeth. Veins in fascicles from the base of the secondary pinnæ, separating in each lobe, one of the divisions ascending to the point.

The surface of the whole plant is polished shining, of a reddish brown color. This species resembles the variety of *H. furcatus*, Brgt, called *H. membranaceous*, by Gutbier, which is common enough in Pennsylvania, especially in the upper part of the sandstone at Pottsville and Mauch Chunk. It differs, however, essentially, by the thick substance of the leaves which easily separates from the stone, by much thicker veins, merely approached in fascicles but not united at the base of the secondary pinnæ, which are longer, narrower, more equally and pinnately divided in lanceolate pointed teeth.

This species appears intermediate between *H. furcatus*, Brgt., and *H. stipulatus*, Gutb.

Abundant in the roof shales of the coal at Colchester and Morris.

Hymenophyllites inflatus, Sp. nov.

Pl. xvi, fig. 6.

A tripinnately divided part of a frond, with primary divisions broadly oval in outline pinnately cut into alternate obovate obtuse inflated lobes, either simple or parted again in short obtuse divisions; nervation obsolete, the veins apparently branching in each division of the leaves, and simple.

This species is intermediate between the two sections of *Hymenophyllites*, having the mode and regularity of division of the first, the thick inflated leaflets without distinct nervation, like some species of the second. It is distantly related to *Sphenopteris Rutæfolia*, Gutb., Verst., p. 42, pl. x, fig. 10 and 11, from which it differs by the form of its more elongated, narrow, inflated pinnules, by the obsolete nervation, etc.

From the roof shales of the main coal, Duquoin.

The specimen is a large piece of shale covered with fragments of the plant, none larger than the one figured.

§ 2. Aphlebia.

Hymenophyllites adnascens, Ll. and Hutt.

The two specimens figured, pl. xvi, fig. 7 and 8, from the roof shales of the coal at Morris, exactly represent the species of Lindley, as it is figured and described by Geinitz, in his Versteinerungen, p. 20, pl. xxv, fig. 7 to 9. But I cannot recognize an identity between the plants represented in these figures. The one, fig. 8, of ours, has the lower divisions short lanceolate obtuse, irregular in their directions, with thin parallel veinlets, and the upper ones narrower, curved, marked also by thin parallel veins branching into each lobe; while the other, fig. 7, has dichotomous or forking, linear, narrow branches, without trace of veins or veinlets. The first of these forms agrees with the description and figures given by Lindley, vol. 2, p. 58, pl. C and CI, who compares the plant to some *Lygodium* or *Hymenophyllum*, but I am disposed to consider the other as a peculiar species. Our fragments are nevertheless too small to allow a precise and satisfactory description. Prof. Lindley considers his species as a climbing fern, twisted round the stem of a frond of *Sphenopteris crenata*, to

1. Hymenophyllites adnascens ? Ds. Hutt. I have referred to this species specimen 1 pl. from Gottroll. It represents a branch which for the size, the mode of division of its pinnules, their length and lanceolate pointed form is nearly like the fig 13 Pl. XXIV of Geinitz Iserstein: which he admits as a branch of Hymenophyllites furcatus the nervation is also about similar to what is marked by Geinitz except that in his fig: the secondary nerve is simple from the rachis while in my specimens, at least for the lower lobe, four parallel secondary nerves go out of the main rachis ascending at first parallel and next further up entering one of the segment of the lobes. no tertiary veins of the upper segments forth. from one of the secondary veins, obliquing the parent vein at first parallel and then separate in entering one of the segment as seen t. 528 fig 14 enlarged part. I consider this as a true Asplenites from the parallel secondary veins as also from the pointed form of the segment and also as a separate species. If Geinitz specimens represents the same, he has not seen the nervation as it is. It could be called Asplenites nervosa. T. S. T.

2. Asplenites irregularis Germ. Vert. Lieb: 5 tab 24. Germar a publié cette espèce d'après les Vertiefungen d'Wettstein d'Hohenstollen des marnes brunes de Sans localité & enlèvement des formations houillères, et enlèvement le même. It can be compared to A. adnatus but the frond is large, the division irregular in their size, more of branching and directions. His somewhat obscure, or coarse Hastt nicaceus shale. d'après Marsh branching from the base in linear irregular during division which Count d'Scholomeus is an irregular, the ultimate divisions becoming narrow but not pointed. No trace of nerve is observable. In the point of branching, the segments are sometimes inflated at least slightly it and never so much as in German figure The ultimate division appear obtuse. but not inflated. T. S. T. It further resembles a Pecopteris than an Asplenites.

3 Hymenophyllites Gutbierianus Ung. as described by Unger and figured by Geinitz: see Ung. Genera p. 132: laciniis pinnatifidis secundariis alternis, linearis-lanceolatis acutis, simplicibus bifidisve, we have only one specimen 1 pl 18 referable to this species. It is easily distinguished from H. Clarkii by more narrow, acute pinnules, thinner leaves, &c.

4. Hymenophyllites lactuca, sp: H. Gutbierianus Ung ? H. Clarkii Lyg. These species are closely allied but distinguishable by apparently constant characters, the first was a twig toward stem which show the parallel nerves and which is often wrinkled across, not pinnately divided, the primary division either at right or opposite, oblique to the primary axis decurring upon it or formed by enlargement of this axis; the segment or ultimate division are narrow, either obtuse or acute H. Gutbierianus has a more extensive and long round stem bearing opposite or alternate linear lanceolate pinnae with lanceolate slightly obtuse division. H. Clarkii has scarcely any stem, appearing like a creeping or perhaps slightly climbing plant bearing long leaves, cut in various ways with the division always very obtuse. The leaves are thick, coriaceous thicker than in any other of the two former species. I consider them a reliable species. in Gutbier Vertiefungen. H. lactuca is represented as Trichomanes crispus p. 13, Pl. 1 Fig 11. - H. Gutbierianus is evidently Trichomanes Crenatus ibid descript. p 14, Pl 1 Fig 14. not nothing in his description and figure is comparable to H. Clarkii.

5 Hymenophyllites villosus sp. nova. (Trichomanes foliis pinnis Gute ? Vert. p 11, Pl. 1. fig. 3. 4, 6, 7, 8 et 13.). Stem pinnately divided. Primary axis thick, nearly

one inch wide, scaly? [illegible] marked with [illegible] sheep, scattered, somewhat large-
pointed; primary division large, distant, oblique alternate [illegible]
divided, secondary [illegible] opposite or alternate,
oblique or open and at right angle to the secondary rachis. broadly lanceolate
in outline, pinnately irregularly bi-pinnate-lobed alternate divisions more or less
curved and obtuse. The surface of these divisions or of the leaf is thickly
hairy or at least covered with "dust" crowded points resembling the pair-bar points
of Allacanthus and of Acacia. The secondary rachis scarcely half as long as
the primary are marked in the same way and with more distant
and deeper points too, as the primary rachis. In H 84 the short thick
hairs of the surface are well distinct. I refer to this H 35, H 36, H 81, H 87, H 35 H 90
H 86. H 84 which has stem and more secondary pinnæ, H 83 H 85 H 82, H 37, H 38
upon H 90 which has a broad stem with a mere tertiary branch. The scales of the
rachis are well seen. They appear at least to be minute long flat & linear, obtusely pointed.
The surface reticuli is represented in Gutbier loc. cit. Pl. I. fig 13 a. The names is
thus established, therefore our species appears to be the same as his.
but he has not seen any specimen with primary stem and his description
seems to ignore apex in terminal. Usually it does not mention the primary
divisions of the secondary pinnæ and marks as pinnatifid ultimate divi-
sions which are rather obtuse. In this species the nervation is distinctly seen. Branch
veins going out of the broad secondary rachis, pinnately dividing in each lobe where
the branches (notonerved) enter each one of the ultimate divisions, opposite
the point. The division of the veinlets is rather by separation than by
true branching. — Specimen H 91. 92. 46. represent a variety of this species
with more ovate tertiary pinnæ, more numerous narrower, very obtuse ultimate
divisions. In these specimens the nervation is still better marked true —
the pinnæ less comparatively to the 3° pinnæ &c &c.

2 6 Hymenophyllites elegans Sp. nov.? It may be a mere variety of the former.
Primary pinna ovate lanceolate in outline, rachis round straight or flexuous
pinnately and distantly branching in nearly opposite roundish lanceolate pinnæ
lying in right angle to the rachis or slightly oblique and curved downwards, gently
flexuous pinnately 5 opposite distant open lobes pinnately cut in alternate obtuse
linear simple divisions. The facies of this species or variety is quite different
from that of the former, all the divisions in their different degree primary,
secondary & tertiary being very distinct. The surface of the stem and leaves is
the same scaly rugose as in the former. One of the specimens H 39. is
remarkable by its tertiary pinnæ or lobes being upon longer, pinnately
cut in short nearly opposite entire simple very obtuse lobes marked at the
point by a mucron resembling a receptacle of seeds. Notwithstanding these
differences, all these specimens of the two last species may represent the same species.
H 87 is perhaps referable to this rather than to the former but the ultimate divisions
are buried in the stone. 19.5.72.

7 One specimen of very small but distinct is referable to Thumpen's species
Mucopteris flabellatum. If the name should be changed my Tachypteris
Was good enough. see sp. H 1113 upon An 7. from Marsillea.

2 8 Hymenophyllites mollis? or flabellatus Schp. a nodule H 16211 has the
appearance of Mollis but has evidently veins like H flabellatus
It may be of the same type as the two following ones which should
be drawn.

1. Hymenophyllites [illegible] appropinquatus or H. thompsi Dy 1681. nodule from Mazon creek. a pinna curved falcate with mixed branches curved or one sided branches inflated. their ends coming into connection with those of an opposite pinna. whose branches are directed in the opposite way. May be a form of H. thompsi. not describable without figure. another specimen Dy 1682 seems to be a incipient stat of the same resembling that kind of mushroom under bar of a hyellaria which I have named Rhizomorphe hyellaria. This is the more remarkable that a large specimen Dy 1683 has exactly the appearance of a fungus of the stem stand be carnose or fleshy cut by the middle and showing the internal organism. All this should be figured and studied.

2. Hymenophyllites (spec nov.) dichotomus Dy 1684. A fragment of Hymenophyllite with primary rachis or stem 5 millim broad, alternately branching or dichotomous like branches oblique, nine cent. long their stem or rachis half as large as the primary one, gradually diminishing upwards, & dividing alternately the branches or pinnules which are shorter and divided in the same way in alternate lacinia. Your form is not very distinct appearing as three pinnated. The lower pinnules have two or three of their divisions each side, the upper one appear much longer. The rachis is pinnulate. The lobe as seen from the counterpart which I do not have, are oblong obtuse. Comparing H. which I have figured now an similar to this. Nothing like it in Gutbier. His two species are fragmentary. Inter species between this figure and [illegible] Gut. (Racophyllum) Dy 1685

3. Hymenophyllites [illegible] from Mazon creek is exactly this species as figured by Gutbier Pl. fig 7. With lobes somewhat enlarged as the species is figured in the same atlas under the name of Racophyllum [illegible] syn. of Asplenites Gutbierianus (nec 7)

4. Hymenophyllites unfolding? Bodies in Dy 1686, 1687, 1688 nodules covered by a tubercle stem which some tops of leaflets like H. flabellatus are coming out. They are all obscure.

5. Hymenophyllites flabellatus? spec nov. Among the specimens brought from Mazon creek and which I have for examination is one representing a kind of oblong body with the surface somewhat like H. mollis from the top of which come out filament or division like leaves of Neuropteris coarsely veined. It might be young development of H. flabellatus.

6. Hymenophyllites inflatus, Lsqu. I have a specimen which shows the lacinia either rounded and inflated as in my figure and apparently linear at the base. Stong has another specimen with all the lacinia very obtuse as in my figure.

7. Hymenophyllites (Rhacophyllum [illegible] Gut). I have three specimens of this species, at least as it is figured on Gutbier Pl. fig 3 which appears to be intermediate between this and Asp. lactuca. The specimens are from D. Britt. N. 107. B. C. D. show flat branches coming out of an apparently broad flat stem; they are alternately divided in lacinia which by subdivision are lifted [illegible] at the point, the lobes acute lanceolate flexuous more or less acuminate. This can not be the same as the var. Gutbieriana. Schimper atlas pl. 48 fig 4 shows the two stems of leaves together. The ultimate lacinia are much longer in ours 10713 shows a large frond of it apparently attached to the rachis of a Pteris.

D 1. Hymenophyllites fimbriatus Sage. Tachyphyllum fimbriatum, Rep. of Geol. Survey of Penn: P. 863, Pl 8, Fig 2. Nothing to add to the description of this species merely to correct it for mode of branching indicating a form adjunately divided. The veins are simple, the first arising in the point of each lobe and evidently have the same mode of divisions as in the Hymenophyllites. Universally affine sage. Fig. 1 is a mere variety of this species. It has not appearing of the specimen of D. pinnatifidum but that it which is figured in the report and which was given to Sager, but it appears to be a good species. The fimbriations of the surface of the leaves is smooth though the borders are fimbriated by veins or hairs.

D 2. Hymenophyllites membranaceous sp. nov. (No 106. 3 specimens from Butts) Pl. fig 1. 2
Fronds membranaceous large, flat alternately divided in large branches divided at the top in irregular lanceolat acuminat points generally short. The primary divisions are slightly turned outside and upward separating from each other by a sinus. All the parts or all the body of the plants are regularly veined in simple parallel very distinct veins forthing once in entering each one of the lobes or divisions. The nervation has somewhat the character of the foliaceous species. But the species greatly differs by its membranaceous & thin consistance, the mode of its division &c. a very fine species. see below D 2

D 3. Hymenophyllites crassicaulis (nobis) Hymenophyllites Wilsonianus Sag. Pl. fig 4, 5 Magoriana? &c. No 107. a of Butts. & c 1684. Plants round and thick. Ovate and indistinctly punctate, dichotomous branches short dichotomously divided & short narrow ultimate divisions forthing at the top in short pointed lacinia. The stem is more distinctly defined than in H. foliiformis to which it is however related. It is flat upon the stone as if by compression. However fig 5 which is from Clinton is flat and the surface does not show any trace of these or punctate as therefore it may be a mere variety of that H. foliiformis. However doubt it and separate it accordingly.

D 4 Hymenophyllites hamulosus (No 60 Butts). Pl. fig 3. I send this branch too large and too particularly divided to refer to H. asperrimus. The stem is comparatively large, the divisions dichotomous at a broad angle of divergence from the main rachis, the ultimate divisions forthing nearly in right angle, gradually diminishing to a foliform point, hooked.

D 5 Hymenophyllites? juncifolius. Pl. fig 6, 7. & c 1681. & 1682. The filaments are represented a little too thick upon the figures. They are simple, filiform or rather vermicular, slightly inflated at the other point coming out in fascicles from an amorphous base, tending to ramify to one side and there the branches attached to a kind of squamiform or burnt rachis curve downward. Fig 6 which is copied from a good specimen seem to represent two branches of the same fascicle opposite and their divisions curving forward each other. The plant seem to have an analogy of character with Fucoides Caudagalli figured by Linnaeus from Almonia. These two species may represent something like H. Stronzi.

D 2! Compare this species to Rhabdophyllum pachyrachis of the Trias in Ten. Fl. Foss. Helv. Pl XXVI f 5. in Lethaea

which it is evidently attached, while Prof. Geinitz thinks that it is fixed in small bundles to the stem, like a parasitic plant. The State Cabinet at Springfield possesses specimens of a large fern whose stem, like that described by Lindley, is bordered by bundles of leaves of the same *Hymenophyllites*. The specimen is obscure, and it is not possible to decide how they are attached to it.

Hymenophyllites lactuca, Gutb.

This species is more rarely found in our Coal Measures than its near relative, *H. Clarkii*, Lesqx. The State Cabinet has a very fine specimen of it in a concretion from Mazon creek. It is distinguished from *H. Clarkii* by its broad enlarged fronds and narrow laciniæ. These fronds or rather pinnæ, on one side of the rachis, which are only visible in part, appear placed in a row; like the alternate divisions of a fern. As the epidermis of some of these pinnæ is destroyed by maceration, the veins and veinlets are distinct, and are seen passing in bundles from the rachis, separating more and more in curving into each division, to end by a simple veinlet, ascending to the point of the acute ultimate lobes.

Hymenophyllites arborescens, Sp. nov.

Pl. xvii, fig. 1 .

Stem long, (the specimen, though broken, shows more than one foot of it,) straight, about one inch broad at its lower end, two-thirds of an inch at its upper part, marked in its length by obscure lines apparently formed by bundles of veinlets and alternately divided in thick oblique branches, more or less regularly and deeply lobate; lobes alternate, simple and linear elongated, or bi-trifid, of various lengths and obtusely pointed.

The divisions of this plant are rather dichotomous, like those of species of *Lycopodiacea*, than pinnatifid like those of ferns. They are merely a continuation of a main axis thrown out in various directions. The substance appears to have been a compound of cellular soft tissue, intermingled with bundles of continuous vessels, forming veins or veinlets, and, by mere separation, ascending to the last divisions of the frond. There is no trace of branching of veins,

but merely of divisions of fascicles of vascular tissue. The species, in its general form, resembles *Schizopteris pachyrachis*, a species of the Keuper.

Found at Morris on a large piece of shale, and kindly presented by Mr. Jos. Even.

Hymenophyllites Clarkii, Lesqx. Y.414.4

Pl. xvi, fig. 1 and 2.

The description of this species is given in vol. ii of this Report, p. 438, pl. xxxix, fig. 7, from a small specimen. It is abundantly found in the concretions of Mazon creek, and, though very variable, preserves the characters which separate it from *H. Gutbierianus*, Gein., viz: its broad, round, or very obtuse divisions, and the great thickness of the leaves, which were evidently hard and coriaceous; for they are not flattened on the stone as in *H. Gutbierianus*, but enter it, and mark on it a deep impression, as a hard body only can do. Of the two remarkable specimens figured here, the first appears to represent a plant with a long twisted or climbing stem. The principal axis is round, grooved, and has its surface roughened, and marked with points or scars, as if it had been covered by hairs or scales. As the stem of the second specimen, which seems to represent a young plant evidently of the same species, is smooth, these points may be the scars of rootlets or suckers, serving as adhesive agents to help the climbing process. The young plant, fig. 2, has a short stem already curved or twisting, and at its base, some filaments resembling rootlets. It would, therefore, be rational to conclude, from these specimens, that the plants which they represent were attached to the ground or to some soft substance, like decayed wood, by rootlets, but were at the same time climbing plants. This would explain the position of *H. adnascens* upon the broad rachis of some ferns.

Hymenophyllites Gutbierianus, Ung. Gen. and Spec., p. 132.

Inv. p. 414. 3. Y. 414.4

The true species, as figured by Geinitz, is in the State Cabinet, in specimens from Colchester, found by Prof. A. H. Worthen.

1 Hymenophyllites Claudii. Leyo. There is in the cabinet of M. Thony a splendid specimen of this species. It measures 23 cent long, 16 cent broad, the frond having a distinct and distinctly striate rachis 13 millimeters broad with alternate decurring pinnae like in pl. XVI of this report, but longer with obsolete nervation. Rachis punctate in the upper part. The same collection has H. Gutbierianus as large as the former but the pinnae are longer, narrower with narrower flat not inflated subdivisions which are linear obtuse only at the point and distinctly nerved.

2 [illegible] Lacoe specimen 683 has [illegible]

3. Hymenophyllites Rhacophyllum (pubescentium?) Lesq. pl. L f. 7. or another name spec. 694 of Lacoe. Has the greatest affinity to H. flabellatum. Base brothe apparently subcordate gradually enlarging upwards [illegible] flabelliform; borde nearly equally divided in short obtuse oblong or linear lobes separated by sinuses of the pinnae all along & the deep or divergent from each other versus distant seen only by transmitting the specimen when epidermis becomes pellucid. dichotomous. The veins and their division are more one or rather generally two millim distant. Woods from the red sandstone Fritton, Jones & Rowney. This is same as Cyclopteris Brownii Ver. pl. in Dawn. Dergna plants of Mazon p. 463 pl XVIII f 6.

4 Hymenophyllites Claudii Ly Lacoe specimen 683a. shows part of a pinna of this species with 4 secondary pinnae sessile and attached to the rachis. The rachis is apparently concave a flat and smooth; the pinnae 1/2 cent distant, united by a base slightly decurrent half a cent broad at base, 2 cent long enlarging upwards to oval. 1/2 cent broad in the middle, irregularly lobed and cut lobed as in this species with obtuse lobes inflated at their apex surface punctulate a rough. This specimen and the whole I have seen of the same character prove that the rhacophyllum are neither the primitive stalk or basal leaves of ferns nor parasites upon them. The specimen should be figured for another vol.

216 1. D Sphenopteris macilenta? Al. & H. Ms 500 is a fond ultimate pinna of this species at last by all its characters except by the nervation where it is totally obliterate. The pinna is 9 cent long, alternately pinnately lobed. (divided) in superior lobes ribbed, truncate with the lobe very oblique, more or less deeply cut, about equal, pinnules decurrent by the broad rachis by the base narrowed to about 6 mill broad where the pinnules measure one and an half centimeter between the borders of the lobes, being a little longer than broad. In ascending the lobes become less marked and the pinnules more oblique or less open become oblong or obovate nearly entire, malles the upper pair being connate to the terminal pinnule which is small, ovate, obtuse. The substance of the pinnules appear thick the surface slightly rough no trace of veins is discernable even the midrib being merely indistinctly observed in one or two of the pinnules by a depression. Lindley & H remark that the venation of this genus should have been very thin as the veins are distant only in the middle. Geinitz shows the veins. We may trace here the upper surface of the leaflets with a thick epidermis on hard a different species though the shape of the leaflets is exactly as figured and described by Al & H. Geinitz's figures of this species are more irregular than our plate.

2. Sphenopteris or Neuropteris sp. nov. — Ms 514 is perhaps referable to the above species it is also an ultimate pinna 6 cent long with alternate pinnules nearly in right angle: the lower ones one, one and a half cent. long oblong, connected at the middle and then lobed at the base, (B) which is cordate; the upper ones entire, oblong obtusely pointed a less obtuse than the lower ones. All have a broad mid rib enlarged at base and apparently the lower leaflet are attached only by the enlarged midrib, the upper ones are sessile by a broad base and near the apex they become joined or connate to the middle and apparently decurrent. There is no trace of lateral veins the surface is thick inflated and obstinately granulose and some of the leaflets have a border or margin all around. I find nothing to which I could refer this species except as a marked variety of S. irregularis.

D 3 Sphenopteris Guthrieana. Geinitz a figure by Geinitz (see p. 408 & 5 H fig 5 & 22. f 12 of this vol should be described may be new remark that no trace of nervation is seen that the lobes which the pinnæ call teeth are more deeply cut, all entire not dentate that the lower lobe is an enlarged figure of Geinitz Pl. 23 fig. 10 a and rather slightly obtuse or in their whole size narrowly oval being somewhat narrower at the base which react to near the rachis. Can not be compared to S. flaccida of Al & H. See also description of Geinitz & compare.

D 4 Sphenopteris tridactylites. The specimen 63 from which the figures are made shows the pinnules are in Brgt. usually sessile and in right angle the rachis not winged. Sometimes the pinnules are indented upwards and their base is then slightly drawn along to the rachis but soon enter it and do not form margin. Brongniart says rachis often winged they generally appear so but when boiled with a somewhat strong glue the large rachis primary or secondary are found not alate (or distinctly and distinctly so. Geinitz in the enlarged fig. 13 & 14 shows the pinnules decurrent which is not exact. Sphenopteris quadridactylites. Pl. XI f. 3 of Guth. quite as S. tridactylites. Pl. XI f. 3 of Guth. quite near rappel par ses lobes (double fig 5 and nonne quadridactylites which he consider as a variety.

D 5 Sphenopteris Gravenhorsti Brgt. Brett N. 118 (Fragment of a large pinna. The secondary ultimate pinnæ of one side only being present. Pinnæ long lanceolate curved upwards obliquely pinnately divided in alternate opposite ferbay divisions oblique to the rachis linear-lanceolate obtuse pinnately lobed / lobes oblong ovate obtuse passing to not deep, separated to near the midrib, venulate lateral veins medial vein pinnately divided, each division entering one of the lobes cord subdivided entire or subdivided in two or three branches each one entering the (left) lobes. It is a remarkable fact that in some the upper pinnæ or even in those of the base the pinnules near the top and in the middle have the epidermis destroyed by maceration these pinnæ then exactly represent Sphenopteris neuropteroides Brgt. fig. 2a of the same plate 55 where S. Gravenhorsti is represented. The lower pinnules

the nervation without epidermis is divided exactly as in Sph. species, the lower pinnules forthing at the base and the division forthing again one or twice, the upper pinnule with rear forthing and the upper most one. This species has the lobes somewhat shorter and more obtuse than Brongniart, I see however no distinction sufficient to separate it.

1. Sphenopteris Schizopteroides. Brgt ?? Leaves tripinnatifid, rachis straight regular comparatively thick (Brgt says Rach. granuliferous). Primary and secondary pinnæ linear lanceolate (marginal the smallest Brgt), secondary pinnæ deeply pinnatifid, pinnules entire (not contracted) (although deeply cut). Nerves decurrent at their point of union with the obtuse sinuses (they are acute in Brgt), the lowest sterile, (not decurrent) not reaching margin nor lobe, as says Brgt). Crenate lobate; lobes very deep cut in short, obtuse, mere undulations. Primary nerve in each lobe throng flexuous alternately forthing erect abscissions entering one of the teeth or sinuses forthing at the top. The very small round punctations the epidermis placed between the forth of the lateral veins.

2. Sphenopteris stipulata Gutb. SS. 184 Tops of a tripinnatifid leaf. Primary rachis comparatively broad, rough or punctate. Pinnæ in right angle or slightly inclining upwards long, linear lanceolate, from 1 to 1½ cent. long. Pinnules also in right angle to the secondary very narrow rachis, oval or oblong obtuse, sessile not decurrent, alternate 7 to 8 millim long alternately deeply cut in from 3 to 4 pairs of oval or round lobes separated by a millim long, the lowest pair of the pinnule at the top sometimes marked with two or three short obtuse teeth, small teeth, the lower pair longer or more prolonged. No trace of nerves or veins can be discovered. For the form of the pinnæ and the shape and position of the pinnules this specimen is like the fig. of the species in Roehl. Pl. XVI f. 6. But the lobes are not always exactly round obovately oval as well as the in enlarged f. 6 a. But some of the are obscurely undulate denticulate or crenate at the top, like the fig. of Geinitz Pl. XXV f. 3. But the lobes are more distinct and more numerous than in the other fig. of Geinitz being generally in 5 or 6 pairs with the top leaflet of the same shape as the lobes only smaller.

3. Sphenopteris (Eremopteris) linearis Brgt. Leaves tripinnate primary rachis broad 4 millim narrowly striate primary pinnæ oblique curving basal long, linear lanceolate with a narrow distinctly striate rachis one millim to broad half round. Secondary pinnæ oblique the upper ones nearly erect, alternate, linear lanceolate in outline with alternate pinnules erect decurrent, rhomboidal or cuneiform in outline (one two or each side,) (one to four pairs) cut in cuneiform lacinæ two or each side, Cleft or truncate at the top (compare for this description of Brgt better than Schimper resembling flabellate elongate and parallel. The only difference between the species and that figured under this name by Brongniart is that the secondary pinnæ are more open erect or in Brgt figure and the pinnules also especially the lower ones not seen by Brongniart equally open the upper one only being erect. But the pencil outline has seen only the upper part of a primary pinna whole one specimen represent the middle or the base of the pinna, one of which is attached to a fragment of broad rachis is eleven cent. long to the part where it is broken and where the secondary pinnæ though still of the same length as exactly shorter, 2 cent long, can already much more oblique than the lower ones. The rachis (secondary is slightly flexuous the epidermis of the upper surface rough the veins being not or distinctly on the lower surface. The specimen was communicated by Prof Safford for the Geological Survey of Tennessee

4. Sphenopteris Schizopteroides ? Brgt. J.S. 1014, 1015, 1551, 1552. Is this species what is considered as S. murrayana Brgt. Leaf bipinnate or tripinnatifid primary secondary rachis rigid, narrow comparatively narrower than in N° 1 of this box, primary pinnæ very long, nearly in right angle. The specimen represent two nearly whole 16 cent long

to 417 b a

Del 1. Hymenophyllites thalliformis Dzyg The specimen in the Museum H. 48 is from Mons and somewhat differs from the one figured in this report Pl XVI, Fig 3. What I term lines or bands in the Colchester specimen which below 6 Spring fields is in the text a branch of Hymenophyllites like H. Gutbierianus with evidently wheel lanceolate pinnae and from the same stem as from its vary three branches which seem to come out as of a common point of origin. The specimen is not quite distinct. One of these bifurcating branches is indicated as in the branches which resemble the young rachis of ferns.

Del 2. Hymenophyllites Stronzii Dzyg ?. Spec: H 100. As in the one figured in this Report (Pl XVIII Fig 1. the form of the button like branches & their division are not definite. The rounded oral appearing like a compound of linear pointed leaves coming out from a common base. These leaves which have I consider to a medial nerve may belong to the first development of an annularia. Another specimen with a button of about the same form indicat a compound of narrow leaves or scales surrounding a piece of branch marked with points and may be only a broken part of some willow or scaly rachis of fern. Both specimens are referred with doubt to this species which is still an uncertain one. It is however clear that H. Stronzii can not be referable to Hymenophyllites.

D 4a. From 417c. Linear (two of the specimens represent fragments of pinna, shorter and lanceolate) 3 to 4 cent. broad. secondary pinnae slightly oblique, parallel, close but not imbricat linear lanceolat (the apical pinnule very small, not distinctly pointed) pinnately more or less deeply lobat, lobes oblong oval, obtusely pointed, cut to the middle in acut sinuse, veined, veinlet upward sparingly obtusely dentat, lateral veins decurrent forming the secondary rachis, pinnately forking 3 to 6 times according to the size of the lobes and their teeth entered to each of the by one of the division of the veins. The specimens agree well with Brongniarts Pl 125 fig 1 differing however by the generally rigid rachis, and the larger size of the pinnule and of the lobes. The nervation is the same. The lobes more or less deeply cut never to one or nearly to one half. and the splet not decurrent, generally in right angle to the rachis. This represents the common form of the species. No 1, 417c might be taken for a fertil part of the same. The whole plant is however more rigid, coriaceous, the veins twice or thrice forking at the top and the teeth not marked, half veined more undulated when the subdivisions of the vein does not indentat. Should be separated and named

D 3 Sphenopteris Schlotheimii Gein. Dzyt ?. S. 57. frond of bi. top. bipinnat deltoid, bipinnat primary pinnae close lanceolat. slightly inclined. 4 pairs, the lowest one 3 cent long the upper 2 cm, pinnately alternately divided; pinnules slightly inclined or slightly obliquer the lowest one 2 mill long 7 to 12 pairs, gradually shorter to the terminal small oval obtusely rounded pinnules pinnatly lobed, lobes cut to the middle 4 lobes on three rounded four dentate, the middle one bidentate the upper entire, lateral veins pinnately branches pro the secondary rachis divided in three four or two branch alternate in ascending each branch entering on of the lobes. From the former species this differs just by its smaller size in all its part, the decurrent base of the secondary pinnae forming border along the rachis, the more distinct longer teeth. From Brongniart species it differs merely by the lobes less deeply separated and the teeth shorter. The nervation is about the same, differing by the branches being merely free abroad the middle according to the opposite lobes which do not being divided as low as no inferen teeth, there being mostly at the top except in the lowest pinnules. I consider it as a var. remark that in these three forms which should be described together there is a great conformity of character and that they may represent parts of a same species.

Hymenophyllites thallyformis, Sp. nov.

Pl. xvi, fig. 3 to 5.

The specimen here figured, represents only part of a frond, which, in its whole, appears to have been large and roundish in outline, with undulate borders and undulate rugose hairy surface. From the emarginate border of the frond, protrude cylindrical branches, either erect or creeping, whose form is totally different from that of the frond. These branches, half an inch thick, are covered with ob-lanceolate, obtuse scales or leaves, narrowly striate, as marked, fig. 4, enlarging upwards and closely imbricate. As the scales are mostly crushed upon each other, it is not possible to see if these stems are fruit-bearing, like the branches of a *Lycopodium*, or are merely the base of the stems of some fronds of ferns, and thus only a different representation of the same organs of the plant. The specimen is good, the various parts of the plant are distinct, and the connection between the branches and the frond is evident.

This kind of development may be compared to that of the *Marchantiaceæ* and of the *Lycopodiaceæ* with the fronds of the first, and the fruiting-stem of the last family of plants. I suppose that the fragment, represented fig. 5, belongs to the same species. It is apparently the plant in the first development of its frond. The specimen, fig. 5, is in a concretion from Morris; the other is on shale from Colchester. The same species has been found also on the shales from Morris.

Hymenophyllites Strongii, Sp. nov.

Pl. xviii, fig. 1.

Stem half an inch broad, erect, undulately veined or striate in its length, bearing alternate leaves? covered with long thick hairs or scales, diverging all around. It is not possible

to see the form of the leaves or divisions, which may be merely part of branches. On the left part of the specimen the stem is smooth and has the appearance of a stem of some species of *Hymenophyllites* of this section; on the other side, which is unhappily broken, the borders are fringed with long straight hairs, appearing to come out from another part of the stem. From this it is hardly possible tc decide if the specimen represents a true *Hymenophyllites* or merely some disconnected part of a Lycopodiacæous plant.

In a concretion from Mazon creek, collected by Mr. S. S. Strong.

§ 3. Schizopteris.

Hymenophyllites mollis, Sp. nov.

Pl. xviii, fig. 2 to 6.

Leaves or fronds formed of groups of thin filaments, emerging from a common support, apparently parasitic, enlarging in growing up or by grouping together, and by compression taking various forms; the laciniæ or filaments are generally united together without distinct nervation.

This is still one of those singular plants of the coal epoch which baffles every attempt at analysis, when one is trying to compare them with representatives of our existing vegetation. This kind of vegetable is doubtfully referable to this section of this genus. Fig. 2 represents a kind of tubercle, resembling a piece of decayed wood, with traces of an axis in its middle and irregular cavities, bordered all around by a short fringe of these filaments which appear as growing out of it in an incipient state of vegetation. These filaments represented separately, fig. 3, are like linear, thin, short, obtuse laciniæ, united together and without nerves, or with thin parallel veinlets. In fig. 4, these filaments, much elongated, are separated in the middle and near the base in various ways, appearing to come out from a mere point and to enlarge in ascending. In fig. 5, the point of attachment of the whole group of filaments is well marked, and from it, the laciniæ seem to be attached or to grow upon one another like the subdivisions of a kind of *Fungus*. Fig. 6 represents a group or a heap of these filaments which appear attached and growing upon each

X 1. Hymenophyllites mollis Leyx. Nothing new to add to the description except that specimen #65 seems to represent a pinna with a pinnatifid rein and laciniæ pinnately decurrent to it, arising downward and more or less disjointed near the point and sometimes from near the vase. Specimen #94 has somewhat the same appearance while specimen #34 show a mass of mixed broken and crushed filaments apparently of the same species. 20/5. 72.

X 2. Hymenophyllites mollis? Leyx. Specimen #99 represents a very divided and irregularly so apparent basilar frond, round in outline, cut on the border, which is like a compound of crushed linear laciniæ emerging from a stem or root ½ inch broad and can't appr. ½ a stem; the laciniæ are superior to it by the vase of an umbrella inverted upon the ground and the stem emerging from the middle. The laciniæ are united, apparently itinated and nerved and thus resemble this species, but the consistence of the leave appears thicker.

X 3 Hymenophyllites? Rhacophyllum flabellatum Lin. A good specimen is no lobe from Maza creek answer exactly descriptive of figure in Schimper Pal. I. P. 607 5., 48 f., 8.

4 Hymenophyllites (Rhacophyllum Sch.) ~~Lonchopteris~~ filiformis Gutb ~~rotata~~? ~~sp. nov.~~ (change name) – Main stem 3 mill broad near the base flat narrowing upward & cent long dichotomous in its primary secondary and tertiary division, primary division long with 5 to 6 alternat branches, secondary division which also branch one or twice All the divisions are linear but narrowing upward and therefore the ultimate division are simple filiform and short. The surface of the stem and divisions is narrowly striat as by parallel ridulets which by separating form dichotomous branches. The species is represented by S. 70. and P. 1874 appear to be the same as Sucoides filiformis of Gutbier a good species.

5 Hymenophyllites trichophyllus sp. nov Lacoe Spec. 349 bears three pinnæ or pinnules alternately attached to the border of a leaf of Cordaites or to a very narrow rachis underneath. The pinnules 5 to 6 cent distant appear like bundles of veins deprived of their epidermis, base of the branch 4 to 5 mill broad, flament round capell form, dispersing fan like, forking once with near or at a distance from the base, then simple flexuous in various directions, some short some long the longer one measuring four to 5 ½ cent long, veined in the upper part in ~~flabel~~ flagellat fascicles preserving the same thickness all the length from the base to the top. This specimen is very remarkable and characterises nothing which might be compared to it except perhaps the branch figured pl. 12 fig. 4. This would be about the same if the nerves were all naked, deprived of epidermis, in longer fascicles flagellated or mixed at the top and simple from the base or from the middle the same character is observable upon fig. 5 of the same tab.

Another specimen of Lacoe 348 has a large simple pinna or pinnule 4½ cent long, two mill in broad at the base, gradually enlarging to 2 cent broad toward the top, veins or fascicle of veins inflated flabellat dichotomous, all curving or hamulose to one side from above the middle in the upper part the fascicles of veins divide and are mixed some thin, intermediat to stronger ones. The laciniæ be coming separate and filiform at the top ~~of the~~ should be preserved for figures – to over

This species can not be compared or referred to a fern, on account of the difference of the thickness of the fascicle of veins. They are indeed all equal in the lower part and the dichotomous division of the same size but in the upper part the fascicles are evidently not a compound of flexuous fibres or rivulets which do not anastomose, nor divide but become separated in their length and either parallel or more or various directions to little bundles of hairs.

Dr (1) Sphenopteris Dubuissonii Brgt. Adv. 145 Butt. decanes bipinnat, pinnæ slightly obliquæ or in right angle long, flexuous? brother secondary pinnæ small obtuse lanceolate pinnately deeply lobed in four pairs of nearly round lobes, fruchentat with a terminal pinnule of the same size and shape; veins scarcely distinct, ~~nerve on both sides and as many lobes of which are divisions of the veinless and broad entire~~ of the lobes, the lateral ones forking on each side and branches entering the points of the teeth. Ader Brongniart. The description is exact and the specimen perfectly concordant. The specimen however is much broader now, the primary pinnæ being pressed flat.

del 2. Sphenopteris tenella, Brgt. not mentioned by Schimper. Butt. N. 152. Leaf bipinnat. primary rachis strong, comparatively broad, rigid, striated, secondary pinnæ linear lanceolate narrow turned upwards somewhat flexuous pinnately divided in distant groups of pinnules distinct pinnately lobed in 3-5 pairs of ~~pinnæ~~ linear blunt obtuse lobes either simple or the lower, rather ~~once~~ many bifid, the middle by a ~~small~~ deep sinus marked, the middle by a small depression marked nerve, all the lobes erected and ~~or~~ turned up in a very acute angle of divergence. The form does not relate to S. tridactylites and at first I considered it as identical with this species but the lobes are much longer generally simple, ever the lowest, slightly and larger in the middle of pinnæ form. Brongniart specimen is not very certain as it is made for the common rachis of a drawing. It is not mentioned by Schimper hence it is difficult to ascertain the degree of relation of the plant. It has some likeness also to S. acutiloba of St. appearing like the figure in Schimper atlas pl. XXVIII f. 2 d 3. But in this species the lobes are acute while in our specimen the pinnules are lobed or slightly larger than the base. As seen by the enlarged specimen Pl. Helv. N. 1 f. 2 the lacinia or lobes are also sometimes linear obtuse. But the mode of division appears different, the lobes pinnule being less divided as in S. acutiloba. — Rem. This is rather S. lanceolata Gutb as figured in Geinitz Pl XXIV f. 4 and must be described such remarking that it has a likeness to S. tridactylites but pinnules longer, lobes also longer either entire or merely emarginated at the top. The pinnule has a deflexed axis with a midrib. or rather a depression as in fig 4a of Geinitz. Make description from my specimen and from Gutb. figure Pl. V f. 12. which perfectly correspond Schimper remarks that it is very near S. acutiloba which is right.

1 Sphenopteris crenata, Dl Hults. Tripinnatifid. Primary pinnæ apparently
large, rachis subcylindrical. Primary pinnæ open nearly at right angle, the lower ones
linear lanceolate, all equidistant, parallel, secondary pinnæ narrow linear lanceolate
equidistant, open either cut in alternate pinnules free to the base ovate acute crenulate at
the border, a nearly dentate one in larger pinnules which represent in the upper part of the
frond the primary pinnæ. The secondary divisions and are lanceolate alternately obtusely
lobed or deeply equally crenate veins pinnate to the lower lobes only forking in
the middle one, simple in the upper. In the tripinnatifid specimens each pinnule
has a medial nerve flexuous and pinnately divided with simple divisions to the lobes in
the lower branches top of the tripinnate ones. The lobes are more deeply, smaller and the
pinnately medial nerve has its branches pinnately divided in the lower lobes, bifid in
the middle simple in the upper ones as said above. The secondary pinnæ
are 11 cent. long and two centimeters broad distant two and one half centimeters.
This species may not be that of Dl Hults who have not indicated the nervation
It is much like Pecopteris serrulata, Daws. Geol Survey of Canada 1871 Pl XVIII
f 2a-2b. Agrees well with Schimpers description.

2 Sphenopteris pseudo-Murrayana. Sp. n. The collection of M. Harvey of Antigonish there
is a large number of specimens referable to this species, some of the pinnules
The fruit is upon large sori placed over the entire surface of the lower near the base of the
lobes evenly or separately. Drummond for his Pecopteris Murrayana.

3 Sphenopteris species nova. Four Harvey specimens 3, 4, 7, 14, 18, 42. Found on a preserved
part bipinnate. Pinnæ nearly at right angle, somewhat flexuous, long and narrow,
distant; pinnules alternate, small, ovate angular, narrowed to the decurrent base
thick coriaceous. Three to five lobed; lobes more or less distinct, or lower, obtusely
dentate; veins very thick the middle one forking into each lobe and forking
again in entering each of the obtuse teeth. This species is related to Sphenopteris
Macrophylla Dl Ltt Hlt f. 6, 7. by the form of the lobes but the nervation wholly
is extremely thick is far different. of the hymenophyllites type. The pinnæ are
nearly at right angle to the base of the decurrent lobes which are generally distant. Herds
to figure.

5 Sphenopteris sp. nov. Harvey spec 39, 39. Has great analogy to Dl. Pseudo Murrayana
but perfectly differs. The rachis of the primary pinnæ is debile, the secondary pinnæ flexuous
pendent, the pinnules with pinnules or lobes distant and distinct to the base, entire or
scarcely crenate, obovate or oblanceolate curved obtuse backward; the veins are strongly
more, very distinct. the pinnules alone are not distinctly seen.

6 Sphenopteris spec. nov. Harvey spec. X 38, 11 47. A remarkable fern which must resemble
a Rhacophyllum. The rachis is dichotomous compound of distinct parallel filaments;
the pinnæ (ultimate) are obliquely pinnately lobed or subdivided in alternate linear
or oblanceolate lobes, each filament bearing at their apex large oval sporangia apparently
composed of three or four sporangia piled upon another. The pedicels of the sori
are comparatively long inclined a curved down. the sori pendulous very distinct
I know nothing comparable to this species which is very distinct except perhaps
Sphenopteris Bronn., Gein. Pl XXIII f. 15. 16.

Suppl. to Asterophyllites

D. 1. Asterophyllites foliosus. Ll & Hutt. A number of specimens N° 736 of Lacoe discovered under the Conglomerat. near Pitt town from a large stem about 10 cent broad to small branches 2 to 3 millim. Stems and branches distinctly striate, striae flat or furrows flat with narrow sharp crests, all very narrowly veined. articulations distant, more or less inflated (inflations seen especially in the branchlets) flat indistinctly marked with smooth tubercles, ramifications in right angle, in many branches 2 cent. wide with articulations 12 cent distant; secondary branches 5 millim. broad & thick with articulations from 4 to 6 cent distant. leaves on branchlets of 2d order in whorls of 8-12 leaves flat lanceolate acuminate, narrowed gradually from the middle to the point of attachment, in comparatively long, 12 cent. in the lowest largest whorls, reduced rapidly & in most cases the upper part of the branches; nodes broad, generally flattened rarely distinguishable. Geinitz has given exact and fine representation of the species with which our specimens are perfectly concordant. Gl. XVI fig 2 represent those we have from the conglomerat N° 736. Geinitz fig 1 has its representatives in fig 2 of the pl. XVII to which I have referred to A. calamoides Schp on account of broader leaves. fig 4 is represented by the long ears of spec. 731 of Lacoe which though narrower are longer than those figured by Geinitz. The shale 731 from Ontario mine is covered with a dozen of those cylindrical ears all about in the same direction or parallel. 7 to 8 millimeters in diameter, flattened and compressed into the rock shale 14 cent long somewhat flexuous with truncate scabs (those in Geinitz are acute, recalls the form of those of the ear figured upon plate fig. 14 (specimen differing from those of Geinitz by length, and truncate scabs being also slightly narrower. The scabs become at the top indistinct by compression in most cases at last. I believe however that they are distinctly a pair & not truncated a obtuse conical ∩ rather obtuse ∩. A. schimperi represents the ears of A. foliosus from there named Calamocladus by Geinitz, Steinberg II. pl XV fig 3. by their large size the species is also different from Calamocladus Calamites foliosus by long ears exactly cylindrical and by bracteiform. Item that the species does not transfer the annual scabs of the branches. Leaves of Asterophyllites foliosus. In Schimper the species Asterophyllites foliosus is referred as Calamites Cist.? It seem different. I should like to see larger specimens of the species. The scars leaves seem distinct.

Compare the Calamostachys described above & Volkmannia elongata Presl figured in Ruehl pl. VII fig 1.

D2 Asterophyllites Labfobe, Daws. Annularia Dawson Schp. Cal 1, 1859 Specimen N° 52 of Aldrich. This is indeed the same figured by Dawson and which Schimper label as an Annularia. The substance of the leaves is rather membranaceous than coriaceous; very thick, basilar 6 to 8 in a whorl, unequal broad in the middle narrowed to the base, gradually as lanceolat, acuminate (sharp) to. The whorls are in the right angle and this is indeed a annularia. Good species. Schimper description may be preserved. The scabs however distinct toward the base is rather effaced from the middle upward

other like parasitic plants, the whole by compression being crushed, forming a kind of flattened ball. In all these varied appearances of the same plant, no distinct trace of a true nervation can be seen. The lines marked on the figures, exactly as they are perceivable on the stone, are more or less inflated in places, and can be considered, as well as the borders of the filaments, as true veins. They do not branch, and are mostly parallel. They may, nevertheless, represent the parallel groups of vessels which characterize the species of this section of *Hymenophyllites*. The substance of these plants was evidently soft, for the specimen fig. 6 represents a compound of many of these leaves appressed and crushed together, and the impression is merely of a thin surface.

All the specimens figured here have been found in concretions at Mazon creek, and nothing except *Schizopteris anomala*, Brgt., is comparable to this kind of vegetation.

Genus Pachypteris, Brgt.

Frond simply pinnate or bipinnately divided, bearing upon the same horizontal plan, opposite entire coreaceous pinnules, with a medial nerve, or without any trace of nervation, narrowed towards the base, not joined to the rachis. The peculiar disposition of the lobes or leaflets of these plants, is similar to that of the pinnules of some ferns. The genus was established by the celebrated author for two species of the Oolite of England.

Pachypteris gracillima, Sp. nov.

Pl. xix, fig. 6 to 8.

The specimen represents only simple branches or simple pinnæ, bearing on each side, but on the same plan, opposite very oblique, linear, oblong, obtuse, narrow leaflets, joined by their base to the enlarged border of the rachis, or of a medial nerve, and thus appearing decurrent upon it. The substance of the leaflets is thick, coriaceous, without any trace of a medial nerve. Fig. 6 shows, apparently, a peculiar kind of ramification by innovation.

The specimen from which the figures and descriptions are made, is on a large piece of shale whose surface is covered by a quantity of simple branches

of this plant. They are placed without any kind of order, crossing each other in various directions, as if they had been strewn on the stone, and therefore the kind of divisions marked in the figure, and abnormal, if this plant belongs to a fern, may be merely caused by the casual superposition of two branches joined by their bases. The form of the leaves, their peculiar position along the stem on the same side of it, resembling the divisions or lobes of some ferns, and their mode of attachment, indicate the close relationship of this plant to those published by Prof. Brongniart as *Pachypteris*. In some of our branchlets the basilar prolongation of the pinnules along the rachis? of the pinnæ has become detached by compression, and they appear in that way as bearing, at the base, a long, linear auricle. The pinnules are a little enlarged to the very obtuse point, as seen in fig. 8, enlarged four times, and in fig. 7, enlarged twice.

On shale, from Morris, collected by Mr. Jos. Even.

LEAVES OF UNCERTAIN OR UNKNOWN AFFINITY.

Genus CORDAITES, Ung.

Ill. Geol. Rep., vol. ii, p. 443.

Cordaites angustifolia, Sp. nov.

The roof of the main coal at Duquoin and St. Johns is in places covered to a thickness of six inches to one foot, with remains of flat, narrowly equally striate, long linear leaves, one to one and a-half inches broad, which, as yet, have not been found in connection with any stem.

From their linear form and from the narrow striæ marking their surface, I refer these leaves to the genus *Cordaites*, Ung., being unable to see the characters which separate these ribbon-like leaves into two genera, viz. *Cordaites* and *Noeggerathia*.

Noeggerathia Gopp. The difference between Noeggerathia and Cordaites is marked in Geinitz p. 40. Three specimens of ours from Mons, Dr Cordaites angustifolius Lesq. (I have examined again these leaves from Valenciennes, Glen Fremont, Pa. 1582 are the same species as those which I have figured on plate III of the catalogue of Cambrai Pa. These leaves are half embracing a stem of about three or one and an half centimetre in diameter, the inferior ones erect in right angle to the stem, the superior ones erect, forming a tuft at the top, exactly linear, as far as can be seen from the numerous fragments which I have examined, or very gradually enlarged upwards, from 12 to 16 millim. broad, one of these fragments, 9 cent. long is 8 to 9 mill. in the narrower end, enlarging to 16 millim. at the other. The surface is distinctly lined, the lines or rivs so well marked that they may be counted with the naked eye generally equal, half round or obtuse, three to four in one millim. distance without any intermediate lines. This character is however deceptive as the distance between the lines is sometimes locally modified and on after erosion of the epidermis, the surface appears nearly smooth or without rivs marked only by undistinct, extremely fine lines. This however is not of general occurrence. Dawson has a Cordaites angustifolius in his pamphlet on the Fossil plants of the Devonian and Upper Silurian formations 1861. The leaves are much narrower, one tenth to one 11th of an inch broad. The engraved fragment pl XIV. fig. 165 is 3 to 5 millim. at one end and 8 millim. at the other, the fragment being about 6 inches long. The figures the rivs equal but does not mention their distance. From measurement of the enlarged figure they are about as distant than in our species or say the two millimeters of space. The figures still some fragments without any description merely corresponding that they may be the same or different. See description of Dr Almond Whytbeam p. 359. where this is described twice See this Vol. p. 361 (2) & p. 359

This form appears to be identical with Noeggerathia palmaeformis Gopp. as figured by Geinitz p. 42 pl 22 fig 7. The surface or epidermis is cut in right angle with the veins by very small undulations forming according to the description of Noeggerathia by Geinitz parallel ridges like the Zellen in the fine Gitterwerk epidermis. But this is a true Cordaites, not a Noeggerathia for it agrees in toto with specimen Dr 4. of the Museum. The leaves in Geinitz figure are also crowd in right angle by those scales resembling the cats of whom organ is not yet recognized. I have three leaves from Cleut. Mo. N. 1146. of Britts which show the point of attachement b a a b like this but somewhat larger as the leaf is larger from a to a the distance is eight, from b to b above the point of attachement it is eleven millim broad or larger than in the figure and the leaf gradually widens so that at 11 cent. meter from its base where it is broken, it is 17 cent. wide. Another half close and parallel to this is all along of the same width 17 cent. while still another on the same specimen has its same point of attachement 7 millimeter broad is 15 millim. wide above the curve b b, gradually narrows above to open up to 13 millimeter. The width of these leaves and their widening or gradually narrowing upward is not a reliable character

2. Cordianthus (Simplex?) or another name. No N 2. a splendid specimen sent by M Mansfeld. could be named C. Mansfeldi. representing a large flattened stem. three cent. broad or more with a comparatively thick coat of coal coley nearly smooth or irregularly lined like the under surface which is also wrinkled across. bearing irregularly placed long racemes from one to 7 cent flattened linear a little more than one millimeter across flowers very thinly lineal in the length bearing mostly one sided three four involucrate buds or

or receptacles, scarcely two millimeters long, one and a half mill broad born upon short branchlet 2 millimeter long at an acute angle with the main pedicel. The scales appear to be three or four, closed together forming then a small bud as seen in the figure. The point of attachment of the main pedicels to the bare stem is marked by an irregularly oval mark (mostly single point). I consider the stem as representing or bearing male flowers probably of Cordaites borassifolia very abundant at Cannello two fragments of which fig 1 and 1a are upon the same specimen (see rectification p. 429 C (1a)). Fig 2. would represent the fruit bearing bud, most like Cordiantheus Baccifer i. G. & P. p. 26. Fig 3 seems to represent a different species, the bud and scales being longer and narrower. The leaf of Cordaites f. 5. measures 6 cent. width in the middle and measures about 60 cent in length, the intervening space between the two fragment figured being 30 cent. the primary veins are distant three or one millimeters or 1/30 of a millim. I find as confirming the opinion that fig 2 and 2a of my plate represent the fruit bearing part of that Cordiantheus, a large number of specimens of C. baccifer found by M. Mansfield at Cannello in connection with C. masculus. They are borne upon pedicels straight or flexuous all the parts bearing, with a bract underneath as I have figured them. The scales covering are imperfect or just as marked upon the upper bud of fig 2. C. baccifer has the main pedicel comparatively thick like the male flowers, flexuous and easily deciduous sometimes three at a time. A fine specimen 163 b. has a branch or rachis bearing at the top a bundle of young or undeveloped buds of the species. The base of the branch or pedicels 2 1/2 millim broad very gradually narrowed to the base of the fascicle of buds where it is 2 millim. The buds are quite close 3-4 on each side forming like a small ear two cent long. The scales are each separated or undulated by the bracts. This is quite distinct from the male flowers of course and shows that they represent two kinds of organs. This stem N. 2. bears obscure scars of leaves having the form of a crescent with the points downwards, about 1 cent between the points placed nearly in quincuncial order, distant one centimeter and a half all round the stem is nearly smooth or thinly irregularly lined at least half a millimeter thick; the scars of the flowering pedicels are scarcely distinguishable.

See that these male flowers of Cordaites represent well enough Goroan gites of Dawson as fig 11 in his Devon-Pl. p. 214 pp. 291-34.

1. Sphenophyllum Moorii sp. nov. Stem simple; straight, cylindrical, equal 3½ mill diameter, undulately equally ribbed, closely articulated and equally so, the articulations upon a branch or stem more than 4 inches long, being only 2 millim. distant; marked at the articulations by 2 deep rounded oval scars of leaflets which are alternately placed in each articulations, the small ribs or space passing from one above to one lower sear between the scars of intermediate articulation see fig. 16. p. 528 c. Leaflets horizontal, entire, obtanceolate, pointed and base separated at the point of attachment to the stem, 7 mill. long; enlarged upward see fig. 16. p. 528 very decidedly, smooth or without traces of rank and veinlets. The few leaflets which can be seen are somewhat buried in the stone and undistinct. They appear however as I have figured them. No species of Sphenophyllum has leaves of this kind. free at base, entirely separated from each other with articulations so closely approached to each others. It is to be remarked that all the specimens obtained of this peculiar species are exactly alike. It should be separated in a peculiar genus, and rather referred to Conifers than to Equisetaceæ, I think. (24. (5. 72.) referable to Schizoneura?

Nem: on our Species of Sphenophyllum after comparing my description & Schimper's Tal. — All are right only Schimper considers Sphenophyllum emarginatum Gein. as Sphenophyllum erosum L & Hutt. and separates them rightly from S. Schlotheimii uniting with it as a variety S. saxifragæfolium Germ. — He admits my Sp. bifurcatum but supposes that it may be identical with Sp. saxifragæfolium. I have seen (Feb. 75) from M. Dos Sobis and a small specimen of Sphenophyllum emarginatum with ears, or fruiting ears mixed with sterile stems. These ears are very narrow about 1 cent. including the open spreading bases or half a cent. for the narrow stem and the nutlets which are proportionally large, 3 millim. opposite or all around the stem and filling the whole space between the articulations. As far as can be seen, the bases under the nutlets are of true Sphenophyllum character only not somewhat deeper. It may be my Interophyllite ovalis but the leaflets are broader and round and the stem narrower

1a. Sphenophyllum Moorii. See the structure and character of Calamodendron in Brgt or Grand'Eury mem. p. 11.

2. Sphenophyllum Schlotheimii? Brgt. Ma 106. is an obscure specimen of a Sphenophyllum with large rachis, 2 mill. articulations close 6t & mill distant with short reflexed leaflets rounded at the top, distant veins no more than 12 on the borders. The large stem the rounded leaflet and distant nerves seem to refer this to S. emarginatum but the leaflets are entire and rounded at the top. For the large stem and the narrow obtuse leaflets they agree with S. Schlotheimii, as figured by Schimper Tal veg. pl. 26 fig. 2. the fruit-bearing stem; but the wheels are close. Middle of a var of S. Schlotheimii.

3. Sphenophyllum longifolium Germ. I have a fine whorl of 6 leaflets Ly 1631., 2½ cent. long from the center where the leaflets are connate. They are cut to the middle & half their length decurrent on the border with 16 distant and distinct veins at the borders, three being the dichotomous branches of two or three primary veins at the base of each leaflet, which divide in ascendency. This specimen is a true representative of Germ's figure & description. A small specimen representing leaflets of small size, fourteen to eighteen millim long is referable to this species on account of the distant & but veins 15. at the borders which are slightly undulate. This however might be S. Schlotheimii Ly. 1639 Another specimen has the leaflets 16 mill. long, proportionally large, 21 to 24 veins at the borders which are undulate but scarcely emarginate should also be referred to S. Schlotheimii Not however very large. see fig. p. 532. 7. for crenate denticulate borders. Jacea Greenman N. 191.

1. Sphenopteridium commutatum Lsqx. The characters and remarks on this species as given here are correct. We do not have any specimen of this speci. in the museum except one very incomplete and obscure ~~as~~ below 16.

2 Sphenopteridium bifurcatum Lsqx. compare Geol. Rep. Ark.[1] and also Schimper. The speci is certainly a distinct one. All the leaflets are deeply bifurcate; first ~~lobe~~ cut in two to near the base with diverging lobes, ~~which~~ the lobes divided to nearly their length in two inter linear pointed segments. Each of the divisions is marked by one simple vein which unite above the sinus and each one has a separate vein to each lobe. Compare fig. 528 fig. 15. The stem is proportionally broad, deeply equally striate in half inch and small narrow ribs.

16 Sphenopteridium commutatum Lsqx. One specimen from Morris, sp. 69 evidently represents this species, though the divisions or laciniæ are only 4 for each leaflet. It has the same broad base, broad stem, thick smooth cuticle &c. Specimen sp. 46 shows also a few leaflets laciniate at the top but the divisions are short and pointed as in a form variety of Sph: emarginatum Brgt. See Geinitz fig. 6. pl. 11.

3 Sphenopteridium emarginatum Brgt. & Sphenopteridium Schlotheimii Brgt. Geinitz in his flora unites both species; but it does not appear that he is right. We have from three places, especially from ~~Morris~~ Morris a large number of specimen of Sph. Schlotheimii in the Study, besides in the museum, which are many inch thick, we have from Morris two very large specimen of both, overall massive, thick, ~~broad~~ broad stem, thick ~~broad~~ wood, ~~thick~~ thick cuticle, ~~broad~~ broad base of leaflet, ~~thick~~ thick cuticle &c. Specimen sp. 46 show also a few leaflet laciniate at the top but the divisions are short and pointed as in a form variety of Sph: emarginatum Brgt. See Geinitz fig. 6. pl. 11. I have seen what Schimper and other authors say on the matter. 21/5/72.

4 Sphenopteridium Lesquereuxianum Gein. It is unlike ~~any~~ any specimens from Lesquereux's collection, ~~from~~ from Carbondale, Illinois, have characters, figure, description of Geinitz and Geinitz. The specimen sp. 75 from Mazon creek is a doubtful specimen with the ~~stem~~ stem of this species but obscure and therefore uncertain. It appears to belong to a low coal and is rare in our coal measures. 22.5.72 / See p. 421 c

5. Sphenopteridium saxifragaefolium Ger. There is in the collection a single specimen evidently referable to this species. It is from Mazon River agreeing exactly with fig. 10 tab. 20 of Geinitz in the

6 Sphenopteridium oblongifolium Germ. Three small specimens from Burnt Branch of Raney, ~~were~~ were small. The specimens represent evidently the Germa species. We want however better specimens of these and the former species.

7 Sphenopteridium? Asterophyllites crassi Lsqx. From the specimen sp. 13 at 50 ft. from Harrison coal near Mazon green by this species seems to belong either to an Asterophyllites. The specimen has small nutlets attached around an axis ~~which~~ which are supported and surrounded by narrow linear ~~leaves~~ leaves or ~~leaves~~ bracts as figured in Lesq. rep. pl. 1 fig. 2. and which therefore look like leaves of Asterophyllites. Those small specimen besides fragments of leaves of Sphenopteridium unguifolium Germ and may therefore belong to this species; but the bracts are ~~more~~ more slender and narrower than in Germa, ~~more~~ more round and the bracts of the leaflets is longer leaf like and not short as in Germa. Specimen sp. 22 from Union Co has still narrower bracts and smaller nutlets and evidently leaves of Asterophyllites as seen at the point of one of the ears. A. 26 is another specimen of the same kind and like the former from Union mines. In this one the nutlets appear elevated into short cones and the under whorl of nutlets is formed by the points of long linear bracts curved upwards. These specimens represent either a species of Sphenopteridium or of Asterophyllites and should be carefully drawn. They are in shape of Sphenophyllum marshall Sphenopteridium crassifolium? fruiting.

8. Sphenopteridium? fruiting of one Sphenopteridium probably S. Schlotheimii? It has narrow ears and short ears like sp. crassifolium Germ. ~~and~~ the specimen has resemblance to S. Schlotheimii especially from the fruiting parts sp. 28. This specimen, sp. 75 from Mazon creek is referable to this. It is broken and obscure. There is a good specimen of Even from the same locality which is evidently a fruiting specimen of S. Schlotheimii, sp. 76. It is a compound of nutlets without bracts or if any, they are very short. From specimen sp. 59 which I shall with this fruiting ~~from~~ from the ~~from~~ from the ~~from~~ from the

p. 484 ?

Genus SPHENOPHYLLUM, Brongt.

Spenophyllum cornutum, Sp. nov.

Pl. xix, fig. 1 to 5.

Main stem round, half an inch broad, articulate at equal distances (about one inch), inflated at the *nodi* or points of insertion of the whorls of leaves, smooth but obscurely ribbed in the length, divided about at right angles by long straight branches bearing whorls of five or six leaflets, joined at the base; leaflets equal, fan-like in outline, broadly cuneiform to the base, divided from below the middle into seven to nine linear, pointed, nearly equal lobes; veins distinct, flat, four to five at the base of each leaflet, forking once, each division ascending to the top of one of the lobes (fig. 5 enlarged).

It is a well characterized and distinct species, and in studying it at Colchester, I have found among the shales a great number of broken specimens, representing different parts of it, and have seen all the leaflets, from the largest one around the broad part of the stems, to those of the branchlets, presenting the same form and kind of division. It can be compared only to a variety of *Sphenophyllum emarginatum*, Brgt., figured by Geinitz in his Verst. pl. xx, fig. 6. But it differs indeed in its essential characters: broader stems and leaflets, peculiar and equal divisions, and a different kind of nervation. The branching, as seen, fig. 1, is also peculiar for a species of this genus. It is worth remarking that the branches of this plant are mixed on most of the specimens with the remains of a somewhat obscure *Calamites*, resembling *Calamites Suckowii*, Brgt, a coincidence which may be casual. In any case I could not trace any evident connection between the two plants, and the stems of this *Sphenophyllum* do not appear as equally and deeply striate as are generally the branches of *Calamites*.

Roof shales of the Colchester coal.

SPHENOPHYLLUM FILICULMIS, Lesqx., Geol. Rep. Penn., p. 853.

Pl. i, fig 6.

Nodule from Mazon creek; F. H. Bradley.

Fruiting catkins of *Sphenophyllum*, referable to *Asterophyllites ovalis*, Lesqx. Penn. Geol. Rep., p. 851, pl. i, fig. 2, are found in the concretions of Mazon creek, and in the shales of Morris.

GENUS ANNULARIA, Brgt. Ill. Geol. Rep., vol. II, p. 444.

ANNULARIA LONGIFOLIA? Brgt.

Pl. xxi, fig. 1 to 3.

STEM thick, round, narrowly and equally striate, articulate, divided into opposite diverging branches placed crosswise in ascending, bearing at the articulations whorls of ovate-lanceolate obtusely pointed flat leaflets, marked by a broad medial nerve.

This species is represented in the concretions of Mazon creek, by two kinds of specimens, with different appearances. Those figured in our plates seem to belong to the upper, still undeveloped part of the plant. The branches and leaflets are crowded and pressed upon one another in a scarcely distinguishable mass, presenting sometimes, as in fig. 1, the appearance of a peculiar species of *Sphenophyllum*. In fig. 2, the branches and leaves are more distinct, and the form of the leaflets is distinguishable as marked fig. 3, magnified. On another specimen, which was obtained too late to be figured, and which shows the plant in its full development, the stem about one foot long, half an inch thick at the base, regularly striate in length, is articulate at the distance of one inch by whorls of leaves of the form described above, and two opposite branches diverging in open angles from under the leaves, and crosswise in ascending. The leaflets, one inch long, one-sixth of an inch broad, twelve to fourteen in each whorl, are joined at their base. The point of attachment of the leaflets upon the stem and the branches, is marked around the articulation by small, semi-lunar inflations or knots, corresponding in number with the leaflets, and placed just above the point of attachment. The plant represented by the two specimens figured, pl. 21, can be compared with what Prof. Geinitz has described and figured in his Verst., p. 10, pl. 16, fig. 1, under the name of *Asterophyllites foliosus*, Ll. and Hutt. The form of the leaflets being indistinguisha-

1. Sphenophyllum falcatum sp. This species appears to be the same as Sphenophyllum saxifragaefolium Germ. It is however remarkable that neither Germar nor Geinitz represents the inequality of the leaflets which in some specimens are much elongated laterally and recurved downward. This peculiar difference of size in the leaflets is remarkable upon a specimen (Sp. 66) from New port which bears narrow lateral leaflets 18 mill long, emarginate at the point with dentate lobes and lobes while the descending leaflets are only 7 mill long, twice as broad and entire or not at all emarginate only slightly denticulate as in Sphenophyllum Schlotheimii. The same difference is remarked in Sp. 1. which has it leaflets emarginate and the lobes more pointed but more acutely than in the var: of Sphenophyllum saxifragaefolium as figured in Geinitz. The same two in spec. Sp. 3 a which has short leaflets of the form of those of Sphenophyllum oblongifolium Germ with leaflets the emarginate and lobes denticulate, not bi pointed or entire and denticulate. All these different forms are easily identified by their narrow inches and the difference of size of the leaflets. For these reasons I still consider this species as a good one and preserve it till evidence is afforded of its identity with an European species. In specimen Sp. 6. there is point of a stem with short leaves, leaflets bifid which looks as if it had a broad stem. The character therefore of narrow stem might be casual. In specimen Sp. 33, the stem is very narrow and all the leaflets are entire. However some of the lateral leaflets are narrower and longer and those [illegible] entire, they are not generally as broad as in S. Schlotheimii and are not rounded but truncat at the top and the veins are more undistinct, the surface of the leaves appearing covered with a crust. The truncated top of the leaflets when undivided seems to be a good character. In specimen Sp. 18 however which represents Sphenophyllum Schlotheimii the leaflets are unequal, the largest being very short; therefore the unequality of leaflets is not a character. — In considering specimen again this Sp. 12 is referable to S. falcatum by the undistinct venation, narrower leaflets and shorter lobes, therefore the characters of the species appear well defined. See p 423 l 3.

del. 2. Annularia calamitoides Schp. appears to be the species which is here described as A. longifolia Brgt.? There is a large number of specimens all presenting the same character. Stem broad, branching like the broad themselves in opposite open divisions from more or less inflated and more or less distant articulations, leaves in whirls of 14 to 16 leaves linear lanceolate, united, slightly more enlarged upwards, ranging in length, from the base to the point of the branches, often crowded and pressed together in half globular bundles. Generally the leaves are open, placed Starlike around the stem. The median nerve is broad, broader still than in the true Annularia longifolia. Those of the leaves are shorter. As said in the description, it is much like Asterophyllites foliosa Ad Hub as figured by Geinitz and probably the same as Annularia Calamitoides Schp. The leaves are flat, not recurved, apparently of a softer texture or more flexible than those of Annularia longifolia. Some Calamites of ours belong to this species; Sp. 59. from Mayo Creek, which answers by its characters to the description and figure of C. ramosus Artis. with Sp. 60. In transel Sp. 54 both sides of the stem and the point of attachment of all the leaves are seen by compression forming an oval circle visible as if the stem had been cut in two. The same character is remarked upon most of the specimens of Annularia with leaves and stem of this species. I have separated the forms which I refer to this species from what I consider as Asterophyllites foliosa Grat. They differ by the larger size of An: calamitioides which has broader longer more obtuse leaves which, when crowded as they are generally

(note) I have a fragment of calamite with an opening den of this species with crowded leaves.

form broader tufts than after: foliosa. It will be necessary however to compare
all these specimens with the simpler species and see what he says about it.

D1 Annularia Sphenophylloides Ung. Varies much in size the leaflet being
in specimens from Zanesville 13 mill. long while on some models of Mazon creek,
the longest leaflets are only 4½ " long. This variety might be comparable to
A. brevifolia Brgt. which is unknown to me or to A. minuta Newb. see, but
it is all the same species. The specification of specimen A 59, sp. 132c which
I placed with Sphenophyllum angustifolium I deny to this species. On 3 seems
to represent the unfolding top of a branch of this species? or some kind of fructification
Asterophyllites rutenulata. On 3a is a kind of fruit of the same appearance
but it has a narrow stem or axis and the elements of fruit, a metal surrounded by
scales or leaves curved inward, are apparently alternate on this narrow stem
like unopened buds. See sp. Pl 107/13. A brevifolia Newb. see also
A. Sphenophylloides

ref. Annularia Spinulosa Sternb. According to Geinitz this is a var. of A. longifolia.
We have three small specimens in nodules from Mazon creek referable to
this species. The leaves are short, varying in length from 4 to 13 mill. enlarged
in the middle, lanceolate forward and upward (flat. about 20 in a whorl) marked
by a deep medial nerve and bearing at the point a short distinct spine.
There is nothing intermediate between this form and the common form of
Annularia longifolia. The leaves are not linear but lanceolate to the point,
the medial nerves broader not flat but half rounded and marked on both sides
by two deep lines or furrows. Except these three specimens all about
of the same size we have nothing which would show the further development
of this species which is therefore still uncertain. His replaced a Annularia
Spinulosa Sternb. in the drawer of the twenty ears of Annularia and
Asterophyllites. 27.5.72. — In reviewing the specimen of Asterophyllites
(?) found upon both of Shale A 15 & A 97 from Salem V. Coal carbon & Rock a nodal
from Mazon creek which belong still to the species and complete the diagnosis. These
fragment represent large portions of branches. In A 15 & A 98 the leaves are 3/4 cent.
long and in this last specimen they are crowded together as at the point of a stem
in Annularia, the articulations being quite near each others and the leaves are all forming
therefore a tuft. All these leaves differ much from Annularia longifolia, not
only by their flat border, they are narrower lanceolate tapering pointed and
distinguished by the departing of the medial nerve, slightly narrowed toward
the base where they are united under a narrow, slightly oblique articulation 15
These are narrower than in Annularia longifolia and still broader than
in Asterophyllites, somewhat rigid, with the whorls of the branches quite
close and 2 rows of the stem turned upward. I consider it as a good species.
The width of the leaves is about the same in all resp. 2 mill. In the longest
of the phorbell 26.5.72. D. 58 a half nodule from Mazon Creek also belongs
to this species. It is also probable that the fine specimen A 99 from
Mazon Creek which represents a tuft (terminal) of leaves more than 4 cent.
longer forming apparently a group of distichous leaves occurring upon a narrow
branch or axis belongs to the same species. The articulations are not
distinct and therefore this branch has rather the appearance of some
Asterophyllites species, as Wolgia than of an Annularia. Traces of articula-
tions however may be seen and the form of the leaves their flat border
broader nerve and apiculate point seem to refer it to this species.
It is put in the same drawer.

D2 3 Annularia radiata Brgt.? Two small specimens A 28. from Sadler Pa seem
referable to this species as figured in Geinitz Pl 12/fig 6 & 7. The leaves however are
longer, less pointed in mine. The specimens are too small and of course for certain
determination. I have seen many whorls of it in Anthracite coal, especially
in the shale of the Morris Co. Coal near Sharon, Penna.

Dr Annularia longifolia sc. Prof. in Grand Rapids p. 17. (3).

Asterophyllites gracilis fontaine, N. 39 (see plate) specimen from Aldrich Woodworth mine. The specimen is covered on the back with branches of the species specially a number of them fruiting, clearly seen when the stone is humected. These branches are slightly slender and a little thicker than the sterile ones, two centimeters long two millimeters broad or a little more, bearing, more generally in their upper part only round small nutlets, in the axils of the leaves as seen in fig. 5 of 3 a enlarged of my plate. As one side of the branches is seen, and there two or three of these corpuscles distinct, there is around the branches apparently 46 or 47 perhaps more of these nutlets which are exactly globular or round flattened and as far as can be seen either sessile or attached by a very short pedicel in the axils of the leaves, which are covered up as enclosing the nutlets whose diameter is about 3/4th of a millim. The leaves appear to be in whorls of six and therefore the nutlets are in the same number varying however according the thickness of the branches. The disposition of these seeds is the same as in the ear in Schimper Pal. Veg. pl. XXII fig: 7 which he refers to Annularia longifolia while Geinitz refers it to Asterophyllites equisetiformis. The last author appears to be right for the fragment of ear of this kind which I have published I cannot report to Asterophyllites as seeds were found in N.W. Wood with fragments only of Asterophyllites see p. 426 a (2)

Dr 2 Annularia longifolia fontaine. Two ears of this species of Geinitz 1632 & 1633 in nodules from Mazon creek. I do not know as yet if the reference to Annularia is right. The description of these ears is given 425 (3). In specimen 1632 the tubercles are, some of them at least separated from the axis and bore upon the stone where they are flattened, their size having a diameter of exactly two millimeters and the surface being flat and without any markings. I counted these nutlets, as described p. 425 b as being four. In the specimen the upper part of the axis, 12 millim broad is marked by four of these tubercles and therefore there would have been at least around it, the same number is marked by depressions around the articulation of 1633 whose axis is of the same width, the articulations being 4 millimeters distant deeply 10 to 12 robbed between the articulations

Dr 3 Annularia Dawsoni Schp a new nov. Stem slender branches bearing verticils of 12-15 linear lanceolate leaflets from 3 to 12 millim long narrowed abruptly from the middle downward and lanceolate sharply acuminate upwards or rounded to a sharp acumination like spine. The consistence is that apparently of the midrib thick and double as with double border. The distance between the whorls is twelve millimeters same distance between the leaves with large veins and the upper ones with small veins. I have two specimen of this on boulder without N the other Dr 140 J Observations The species somewhat resembles by the form of its leaves Asterophyllites latifolia Dawson of which Schimper has made Annularia Dawsoni. The branches however are not quite of slender the leaflet more abruptly and acutely acuminate two nerved. It somewhat resembles annularia latifolia in its small form but greatly differs by the small number of its leaflets which comparatively very broad nerves and long sharp acumen. See 1133 c 3a

4256.

D 1. Annularia inflata Sy. I have compared still one new, carefully the recent specimens of this species with those of A. longifolia and find them persistent and always distinct. We have now in the museum duplicates of the different varieties or forms of this species, corresponding with the forms and various sizes of A. longifolia: viz: short or common leaves with shorter leaves, and other with narrow leaves. From Newport we have the species also in various forms and quite as different by compression from A. longifolia, the leaflets being broadly obtuse at the top in fact by compression they are acute in A. longifolia. One small specimen from Mattagan has also finely characterized small branch of this species. We have it as yet only from Mazon creek, Rhode Island and Mattagan. It is remarkable that though very abundant in the nodules of Mazon creek, we have no Annularia of any kind from the shales of Illinois Sec 1 a.

Sec 2. Annularia ? [illegible] the specimens from Golconda there are two very small [illegible] No 61. [illegible] Annularia ? whorls, one [illegible] the whole scarcely broader than 3/4 mill. The central leaf is very upright, [illegible] Annularia are seen diverging [illegible] the leaves are simple, linear, slightly [illegible] to the point, simple except one which appears branching from the base and [illegible] nerved. One of the specimens from the [illegible] has a branching in two from below the middle or nearly so in a [illegible] stem. This gives a somewhat [illegible] appearance to the specimen. Annularia ? No 61 b. It evidently another species. It represent part of a branch [illegible] bearing whorls of short leaves no longer than the internal between the articulations; the leaves narrowed at base curving in such a way that the round point of the leaf appears [illegible] to the stem. [illegible] shaped obtuse thick carpels and may be referable to some kind of Antholithes. These specimens are in the drawers of the undetermined fruit of Annularia &c. To this form is referable (No. 3) specimens from Gotts mill.

3 42 Sphenophyllum filiculme Ler. A specimen from Watts No 62 has of this species a branch eleven cent long with filiform leaves less than one millim. thick, irregularly ribbed, slightly inflated at the nodi; articulations nearly 1 cent. apart distant with very open leaflets, the lateral ones 6 to 7 millim long the lower ones only three and a half millim, more bunched upwards, all truncate at the top some deeply lacerate with three numerous veins ten to twelve at the top, [illegible] four apparently free at the base. This has a peculiar facies, all the leaflets being bunched downward and laterally. This appears to be a good species.

D 1a. Annularia inflata Sy. A small specimen from Spring Creek in Gurley with 15 leaflets from the whorls only 12 to 15 millim in diameter with all the characters of the species [illegible] 15 millim in diameter with leaves 8 cent.

D 3a from p 423c (3) Annularia [illegible] sp. nov. ? Has from Em No 36 as annularia figured which has been likewise by Dr. S. Dawson, Rep. and which I considered as A minuta, Rep. a species which I do not find mentioned. It is the upper part of a branch delicate in outline 4 cent wide at the lower part between the point of the secondary branches which are in right angles and 3/4 cent. long, the upper branch being simple. Whorls of the primary branches 11 mill distant with leaflets from 11 to 12 averaging 5 millim long, those of the branches four millim distant with leaflets 3 to 4 mill. long, those bunched outside of the lateral ones longer all obconeolate rapidly obtusely pointed with [illegible] really scarcely distinct. It differs from Dawson species in Qual. Journ. (as my Carbonia) by these leaflets more abruptly cuneate obtusely pointed and is a true Annularia. There on the reverse of No 32 another specimen of this species with short bare from the secondary lateral branches with leaves still unfolding, the buds in right angle to the branches.

See p 419 fig 2.

ble in the above mentioned figures, a close comparison with our species cannot be established. It is nevertheless evident that it does not represent the same plant as ours, as its stem, though striate, like a *Calamites*, is not marked like ours by any knots of the articulations. From the mode of division, the form and the size of its leaflets, this species of ours is a true *Annularia*. The one described and figured by Messrs. Lindley and Hutton as *Asterophyllites foliosus*, and which does not even resemble that of Geinitz, has linear lanceolate, pointed, narrower leaflets, and is not comparable to this, which I refer with doubt to *Annularia longifolia*, Brgt., considering it rather a distinct species, under the name of *Annularia calamitoides*, Schp. Prof. Schimper has published, in his Pal. Veget., p. 349, pl. xxvi, fig. 1, a new species which, though the leaves are narrower and more acute, is nearly related to this one, if not identical with it.

Annularia inflata, Sp. nov.

Pl. xx, fig. 1 to 3.

The essential difference which separates this species from *Annularia longifolia*, Brgt, consists in the form of the leaflets, which are ob-lanceolate, obtuse, subcylindrical or inflated upwards without trace of medial nerve, or with merely an obscure line indicating a central vessel, while the leaflets of *A. longifolia*, are flat, with recurved borders and marked by a thick, flat medial nerve. The difference in the form of the leaflets is seen in fig. 3 and 4, and their comparative sections, 3*b* and 4*b*. The stem of this species does not appear as thick as in *A. longifolia*, and the branches come out in opposite direction from the middle of the whorls, or rather from above them, than from below.

The specimens figured are from the concretions of Mazon creek, where both species are abundant, and may be distinguished always by the same characters, without any form appearing intermediate. It may be that we have here two parts of the same species, one representing branches growing out of or above water under atmospheric influences, with dry, flat leaflets like *A. longifolia*, the other, representing the floating part, sustained in water by bladderly-inflated leaflets, as shown in our species. But if it is so, it is peculiar that this, so different a form of a common species, has not been found elsewhere and described before.

Genus ASTEROPHYLLITES, Brgt.

Ill. Geol. Rep., vol. ii, p. 444.

Asterophyllites rigidus, Brgt.

Pl. xxi, fig. 4 and 4 *b*.

This species has been referred to *Asterophyllites longifolius?* Brgt, p. 444, vol. ii, of this Report. The whorls of the leaflets, very close to each other, indicate the top of a branch. The leaflets are about three inches long, not quite rigid, not open as in *A. rigidus*, but they are of a hard, solid texture, exactly linear, marked in the middle by a deep medial nerve, reflexed on the borders, canaliculate on the lower surface, thus presenting the true characters of *A. rigidus* as recognized by other and better specimens from the same locality—Mazon creek. The true *Asterophyllites longifolius*, Brgt., has been found on shales from Morris, by Mr. Jos. Even. It greatly differs from *A. rigidus* by its leaves, which are soft, flat, scarcely marked by the medial nerve, ascending along the stem and undulate, and by the narrower, nearly smooth stems and branches.

Asterophyllites grandis, Ll. and Hutt.

Foss. flora, i, Pl. xvii.

Found in fine specimens on the shales of the coal at Morris. Leaves still narrower, and whorls still more numerous than indicated by the description and plate of the English authors.

Asterophyllites foliosus, Ll. and Hutt.

Foss. flora, i, Pl. xxv.

Not rare in the concretions of Mazon creek.

Asterophyllites tuberculatus, Brod., p. 159.

In the shales at Morris.

6. Asterophyllites. — The remarks on the species of this genus are made without Schimper's Palaeontology and are therefore subject to revision. They apply especially to the species as described by Lesquereux and Dawson. See Dept in Grand Eau Mem. p. 17 (3).

1? new Asterophyllites Cistii sp: nov.? Is comparable to Annularia Calamitoides Schp. but differs by narrower shorter, linear lanceolate pointed leaves, with a narrow medial nerve. From Asterophyllites equisetiformis it differs by broader and proportionally shorter whorls of only about 9 leaves and the soft substance of the leaves. It may be some variety either of Annularia Calamitoides or of Asterophyllites; but in all the specimens the characters are well marked: sp: A 31 from Pomroy, A. 100 from New Jersey, A 18 from Dolfrith and A 27 from Hazlegreen.: Stem broad, smooth, distantly and obscurely ribbed, narrowly striate, distantly articulate. Stems leaves erect, along the stem; branches open flexile; articulations about ¼ the distance of the length of the leaves which vary in size, diminishing of course toward the point. Branch leaves in whorls of 9 to 14 leaves, open or slightly turned upward, but not curved, apparently soft, flat, linear lanceolate pointed, proportionally broader than in the species of Asterophyllites; medium length 15 mill 1½ mill. wide, median nerve flat, narrow, indistinct. Specimen A 18 has on its back a Calamites, C. Cistii Brgt exactly answering Brongniart description and which indeed differs from all the species of Calamites. It has also the character of the stem described from the other side of the specimens and therefore indicates this species of Asterophyllites which should be named A. Cistii as a new one. (27.5.72).

From an ear upon the back of specimen A 14. It is seen that the species (fruiting) which in the Report of Geol. Survey of Penn: pp 852 is named Asterophyllites lanceolata is the fruiting part of this species. Stem fruits are narrowed to the base into a short pedicel, varying in width, including the scales from one to 2 p cent; articulations close to each other, not more than 5 to 8 cent distant, scales narrow, united to half their length, linear lanceolate pointed twice as long as the articulations, greatest in any specimen to 2 p cent with their divisions of the same form and character as the leaves, closing together by their point at the top of the ears. Fruit cone of the specimens has the lower part of the ear denudated from its scales, there is nothing seen under them to indicate the form and nature of the organs which they cover. It is apparently a powdery matter, perhaps pollen or the like. I considered them as male flowers. See p. 424 ½ 16.

2? Asterophyllites sublaevis Lsqx. The species as described and figured in Penn. Geol. Report is good but it is too briefly described. Stems are broad, smooth, without striae or striae with articulations comparatively at a short distance, marked by whorls of linear lanceolate comparatively broad erect leaves. Branches short with a thick stem, short broad open or erect leaves lanceolate pointed, sometimes curved inward, in whorls few leaved, 10 to 12 leaflets. Species well defined by its comparatively short leaves, broader at base merely lanceolate (not linear) and its thick stem and branches which appear smooth, not striate. This also different from its related species by the small number of its leaflets and the closely approached articulations of its branches. Stem about 1 inch wide has the articulations 1¼ inches distant: branches 1/3 of an inch wide have articulations at the same distance of 1/3 of an inch. (27.5.72.) This species is common upon the shales of Newport Coal B.S. but there is not any large stem or calamites seen in connection with it specimens. The large stem seen is that marked above, about 1 inch thick. I have on specimen from cannelton No 255 branches 6 cent in thickness articulations 15 mill distant.

3. Asterophyllites equisetiformis Schl. & A. grandis Stbg. The difference between these two species is not easily recognised and perhaps they must be united in one as has been done by some author. The specimens which I separate as representing A. equisetiformis have the leaflets somewhat shorter and broader either open or erected but not arched upwards as in those which I consider as of A. grandis or less numerous.

424c. in the specimens of the species. A. grandis the stems are large, one inch wide, with distant articulations, inserted in the under part by oval somewhat tubercled distinctly equally distant with obtuse broad ribs separated by equally obtuse broad sulci. The coaly epiderme is persistent as also scales and moths. Under if the surface is equally so. It assumes at the base the character of Calamites Suckowi except that the intervals or furrows between the costa are as obtuse and as broad as the back of the costa. It will be necessary to see Schimper about these two species. In A. equisetiformis or in the specimen which I consider as the species the stem is nearly smooth or faintly marked by undulation running from one articulation to the other. As can be seen in sp. A 104 the base of A. equisetiformis or of it stem is twice as thick as in A grandis. 27/5 72

16 no Asterophyllites tisticus as marked above appears to be A. foliosa Ad. Br. as described by Schimper Pal. 1. p. 326. It agrees about exactly and from remarks I have seen that Stur unites this species with A. equisetiformis to Calamites Suckowi. Compare shall with Schimper plates when I have not got. Reviewed again. Annularia foliosa and the Asterophyllites are different. see 1°.

D/1 Asterophyllites longifolia Sig.t. The species from our specimens is recognized by its long linear narrow leaves, with raised keel by more distant articulations. The bases are not as regard nor as much arched as in the following species. Except the rigidity of the leaves, the characters however do not exactly accord. Schimper says of A. equisetiformis that it has the medial nerve very narrow which in specimens shown it as raised as in the other species. Reviewed again. Annularia foliosa and this.

D/5 Asterophyllites rigida Byl. In this species I refer the specimens with long, narrow rigid leaves more or less curved upwards sometimes very long and narrow as in spec A. 46. Whose leaves are about 4 inches long, narrow upwards, inclined in such manner that the forms some many together. These stems have a channelled keel medial nerve or are mucronate. But the nerve is not percurrent as Schimper says. My about 1 mm as in the former species. From his remark in Geinitz Sig. of this species that Lesquereux A. equisetiformis Asterophyllites longifolius A. rigida, our specimen A 46 marked above should belong to this quoted var. which is not described in his text. in the remarks of him afterward upon A. longifolia Germ. but more confounds the question. Le Bucklmannia longifolia Heer of fig 1 tab 58. is by its calcet like our specimens of A. longifolia but has not as regard leaves and not as curved. However this specimen by its narrow leaves and nearly rigidity on axes might be referred with A 115 to longifolius Like the specimen figured in the Sept Mts. this vol. p. 21 fig. 4. I do not think however on first that this is right. See p. 427 & 2.

6 D Asterophyllites grandis var delicatula. This variety is represented by a number of specimens from Newport. It is probably A. delicatula Byl. as quoted by Schimper Pal. reg. p. 325 as var. of Asterophyllites grandis. In all these specimen the leaves are narrow as in A. grandis and generally short. There are however branches which bear leaves as long as those of the common form. I separate these specimens as a type variety.

7 D Asterophyllites gracilis Dgn as figured and described in Ann. Sci. Nat. p. 310 fig 44a is a good specimen evidently identical with what Dawson has published in Precursor-Foreign flore Canad. Nat May 1861. 2.8 as Asterophyllites parvula. In the Ms. report it is 1860. here is some priority. I consider this species as a good one. We have it in three various places. In the coal measures See description in Ann. Sci. of the specimen is specimen A 310 shows the form of the base as narrowed downward from the nodes and upward slightly enlarged to an obtuse point in three A 310 and may indicate another species though the specimens bear one of the same size and the whole stem also is scarcely perceptible with marked eyes. From Newport. Pal. Vol 18. this A. delicatula Brgn quoted Comt. II 49 fig 2 which is not like the specimens.

See also Asterophyllites Saxonica Heer Pl. XVIII f. 4.

1° Asterophyllites equisetiformis (Schmidt - foliosa) and Asterophyllites tisticus I consider as identical. The first is a specimen with cross branches, pointed bases and fine keel. The other is an Asterophyllites irregularly branching with linear, narrow rigid leaves all more inclined to the joint. The medial nerve is very narrow, scarcely perceptible with the eye. See Asterophyllites grandis etc. 477 3

Sci. Nat. May 1861 p. 2 Precursor Flore Canad. 423 01.

Fruits of Asterophyllites.

Calamostachys Schp. Weissmania Hern.

1 Calamostachys major Ren. one specimen from W. Wood A. 7 b. 15 same as the figures and description of this species in Grand'Eury Veteran. pl 32, fig. 5. 6. 7. much like what I consider as fruit of Asterophyllites Castor but with shorter less numerous bracts. Specimen incomplete. is macrostachya.

2 Asterophyllites apertus Sqq. The description and figure of this species in Geon. Rep. carnif. p. 352. pl. 1, fig. 4 are not satisfactory. Stem as yet undescribed resembles a Rhoeophyllum. The naked axis 5 mill wide is marked by equal smooth striae 4th that of a Sphenophyllum, articulated at the same distance as the midst of the axis or branch, slightly inflated marked between each striae at the articulations (6 striae are visible) by small brown points indicating insertion of the point of attachement of leaves or scales. These leaves are short broadly truncate, apparently united together forming sheaths which are open though curved upwards and overlapping each others. I can compare this to nothing published as yet. The space between the whorls does not appear to contain any matter or substance resembling like fructification and the specimen is too broad and too long to consider it as a stem of Sphenophyllum. The part seen a mere fragment is 5¼ inches long, perfectly linear and equal, 3/4th of an inch wide including the leaves or scales. whose borders appear truncate - crenate. 29.5.72. We have two specimens counterpart of a triad. sp. A 6.

3 Annularia longifolia fruit q.? We have a number of specimens from Maya creek. A. 49, A. 143 & 144 which are very good and show the details of the species. This the same species which I gave in the Textbook report, a small broken specimen in Asterophyllites crassicaules. The length and width of the ears are as described in Annularia sp. The nutlets at the ends of the ears are in 4 of whorls abortive, the point toward the axis, their internal structure might perhaps be studied with microscope section of the specimens of Maya creek. in the specimen A 20 from Gottlieb, the ovules appear rather ovate bordered with a narrow linear bordered curved inward nervil, about twice as long as the articulations. Sterile branches there is in the museum a specimen of Lesley collection No 58 which I refer with much doubt to this species. It is 17 centim. long a little more than one cent. wide articulations distant only 4/5 mill.; bracts are narrow and numerous not nearly as much as the articulations; ovules none or the ears are only upward longer than twice the distance between the articulations; ovules none or none visible. From 4 centimeters below the top, the leaves become regularly joined together and against the stem as if the nutlets had there not been formed. Just at the point both like the top of a large fruit branch of Asterophyllites. Enough to represent fruit of Annularia. This species appear different from A. longifolia.

9. 4 Asterophyllites ovalis Sqq. I do not know to what species the specimen are referred. Fruit may be still Annularia longifolia. The axis is not [illegible] the ears, more than twice as long as wide, ovate lanceolate; the bracts some what shorter broader with a deep median nerve and the ovules round smaller or two ons. specimens A 13 & 14 c are of the same size with still narrower ears more crenate leaves. A 25 is towards or the too obscure. I marked them all under the name of Asterophyllites ovalis. The ears are only 3 to 4 cent long and only ½ cent wide. May be fructifications of Annularia sphenophylloides Compare fruit. Ears are comparable to the ears in fruit of cinct. p. 117, fig. 3. of Asterophyllites equisetiformis. C. 1 is the species we have a fragmental specimen; A. 124 which comes from Maya creek, whose internal structure may be studied and described.

8. Asterophyllites tuberculata Sqq. Schimper considers this as the fruit of A. longifolia. Three specimens or more of them are from W. Wood where Asterophyllites equisetiformis is found and no specimens of A. longifolia has yet been found. Fruit exact could be. It is perhaps a variety of Asterophyllites. What the impression Calamostachys major. Three specimens are also the drawn undetermined fruits of Asterophyllites? See p. 362. & 426 Calamostachys.

Asterophyllites ovalis see p 426c (1)

425, 6. 1 Equisetites occidentalis Leq. Compare E. ligulatus Germ. Mass: 2 p. 27 tab X.
" Diaphragma obliquè planum schistosum penetrat and minus perspicue angulas ejus
" partes oculo profert. adsunt autem caulis adsunt folia basi in involucrum coalita
" Folia lanceolata longitudinem 6 linearum attingunt, involucrum diametrum 3 linearum
" fere excedit et folia Equisetaceorum more et longitudine et latitudine longe superant.
" Caulem apud Lacyng fuisse credere fas est. Our species is related to that of German
but distinct by the large size of the vagina, and by the third nerve which marks the division
and descend to the base of the vagina. It may be the same species nevertheless. It still
differs by the rivulets which descend parallel to the medial nerve. But there are only
distinct in some specimens. We have from mayo creek a very large number of
specimens referable to E. occidentalis. most of them showing a mere part of the
sheath with three divisions. In three of them the sheaths are about entire. No speci-
men is found at Mayo creek of the ear of Equisetum infundibuliforme except one
piece described here below. But of E. occidentalis we have a fruiting ear? E.I. and
roots? St. 54. & St. 53. - What I refer as fruiting ear to Equisetites occidentalis
is an obconical body originally cylindrical? flattened in the stone, 7 centim long
13 mill. wide at its base, 25 mill wide at its upper end where it bear sheaths of the
same form as that of pl. 21 fig. 5 though shorter. the part denudated of scale is marked
across by strong wrinkles or rough costæ often interrupted and therefore not exactly
parallel. as in p. 129. fig. 1. The space between these horizontal costæ are marked by
thin lines like in Calamites which are continuous across the costæ and are seen
passing above them. This may represent the young shoot of Equisetites. Specimen
E 2 represent about the same part but the stem is smooth over wrinkled and
attenuated at base like a branch. I refer St. 53 & St. 54 to roots of the species.
This last specimen represent the phragma of a cylindrical stem 3 centi. wide on the
borders of which the recurved base of broad costæ are seen and from which divers
thin little cylindrical irregularly thread branches not articulate, without leaves
whose appearance and consistance is that of roots of Calamites as figured by Schimper.
These specimens may represent merely roots of Calamites. Of sheaths like that
figured loc: cit. the museum has yet still in a better state of preservation as the specimen
figured presenting exactly the same character. One of the specimen E 7 has the division
of the sheaths broader and evidently striate or veined parallel to the medial nerve
but it appears to show the outside part of the sheath while the other show the inside.
2. Equisetites infundibuliformis Gein. We have of this species two large part of
stems or ears less than figured by Geinitz Tal. X, fig. 5 and one similar to the
modern little fig. 7 of the same plate. Dasper Geinitz cette empreint should
represent the upper part of the cross section of an ear? But apparently our specimen
E 23 is something else. It is a star with 28 rays 11 mill. long united to near the
point where they divide into a short abrupt point. the middle of each ray is
marked by a strong nerve. The specimen is perfectly well preserved and shows
evidently the sheath of a Equisetites. See 426. 4
D3 Equisetites ? Two small specimens representing part of sheaths or
leaves which appear to surround a stem being united from the middle upward
and then taper pointed. point sharp. Back of the teeth has a medial nerve descending
to the base of the sheath which is only 12 mill broad see figure St. 529 fig. 2. The
base appear marked by three small tubercules at the base of the nerves. I think that
something of this kind has been published in the Palæontographica ? 28. show
leaves of the same kind surrounding a narrow axis and apparently ? Leptostrobus ?
the blade having glued on the borders see description in Lyell's travels in America p. 440 pl. 24
D4 Equisetites ? Spec: E 22 a half nodule from Mayo. Looks like the base of an
Equisetites part of stem 7 d.a.m. long 23 mill wide marked by equal flat ribs furrows
3 mill. wide with a narrow furrow and having at its base and on both sides what appears to
be large tubercles and in the middle a small wide with 2 long appointed articulation
small round tubercles

Genus EQUISETITES, Sternb., Vers. ii, pl. 43.

Stem fistulose, cylindrical, striate lengthwise, articulate, simple or branching at the sheathing articulation, sheaths attached under the articulations, erect, dentate.

Equisetites occidentalis, Sp. nov.

Pl. xx, fig. 5.

We have only one sheath of this species, the first trace of a true *Equisetites* found in the Coal Measures of this continent. The sheath is open or unfolded, somewhat broken in the middle, about three inches across, two inches long, regularly divided to about the middle by lanceolate, obtusely pointed teeth, marked by a strong nerve, which descends from the point of the teeth to the base of the sheath. The surface in the middle and between these nerves is irregularly wrinkled, and the base, in the line of connection with the stem, is marked by regular, half round notches, corresponding evidently with the striæ of the stem.

The specimen is from Mazon creek, a concretion where this part of the plant is distinctly preserved. Another specimen from the same locality, but in a bad state of preservation, contains also fragments of an *Equisetites*, whose specific relation cannot be recognized. It has the remains of a stem about one inch in diameter, with a lacerate sheath.

SELAGINIÆ, Endl.

Genus LYCOPODITES, Brgt.

Ill. Geol. Rept., vol. ii, p. 447.

Lycopodites annulariæfolius, Sp. nov.

Pl. xxi, fig 5.

Stem round, as seen in fig. 5 dichotomous, bearing opposite leaves, apparently united by two at the base, half embracing and slightly decurrent; leaves linear-lanceolate, obtusely pointed, slightly narrowed to the base, marked with a medial nerve, disappearing above the middle, open or slightly reflexed.

The mode of branching of this species, by a peculiar kind of dichotomy observable in some *Lycopodiaceæ* of our time, the *Ruelliæ*, for example, indicates the nature of this peculiar plant. It is not quite evident that the leaves are approached by pairs, and placed in two parallel rows or distichous; the specimen shows nothing more definite than what is represented by the figure.

No species of *Lycopodites* of the Coal Measures has been as yet published having leaves of the same form and type as ours; the only one somewhat comparable to it is *Lycopodites macrophyllus*, Gold. Flor. Saar., i, p. 12, pl. 1, fig. 5.

On a concretion from Mazon creek; in the cabinet of Prof. A. H. Worthen.

Lycopodites Meekii, Sp. nov.

Pl. xxvi, fig. 6 and 6*a*.

Stem very slender, about one-sixth of an inch thick toward the base, dichotomous, with continuous, elongated branches, scarcely diminishing upwards; leaves imbricated all around, narrow, linear, lanceolate, acute, erect, or slightly open and curving upwards at the point. As seen, fig. 6*a* enlarged, these small leaves are thick, concave on the inside, sharply pointed, not enlarged, but semi-embracing at the base, and without trace of a nerve.

1 Lycopodites Meekii Dgx. Beside the specimen Dg 7 on which this species is formed, I refer to it a number of others mostly from Mora which appear to belong to the species. Some of them show pointed bracts and broader leaves as in L. cavifolius Hk by Report which I have not on hand at present. Dg 1 & Dg 2 which I shall refer to L. cavifolius. But they are obscure and perhaps mere varieties of the common form. In a large specimen Dg 11 the bases appear to have a thick thread obscure medial nerve. Compare figure of L. cavifolius which may be referable to this.

2 Selaginites unicinatus Dgx. I commit to this species with the Rhizomopteris ? unicornis Schp but I doubt that it represents plants of a rhizome. Some of the branches the primary ones, there it represent rather a creeping than an erect form. Are somewhat thicker but the division become very slender and no rhizome branches in that way preserving leaves &c. The leaves are thickly crowded linear lanceolate pointed apparently longer than in Selaginites Erdmanni as figured in Germ. It must be said however that in all our specimens it is mixed with branches of them. But the same specimen have also leaves of Lepidodendron, stigmaria branches of Palaeonitis &c.

3. Lycopodites ? laxifolius. Sp. nov. Dg 4. Double specimen from Indiana. Stem erect or ascending carried 8 mill wide nearly the same width in the whole length in 18 & 20 decim. covered with closely appressed and imbricated lanceolate or linear lanceolate leaves of a thick texture about 8 mill long, pointed. In the upper part the stem bears on one side inclined ears, 4 mill broad, three cent. long which appears to be organs of fructification and thus the plant is a true Lycopodium. The ears are covered with more open leaves or scales than the stem. They appear to bear pulverulent glomerules; but the specimen is not distinct enough to ascertain their nature and position. This plant was the only one found in the shale of black creek near Indiana near new Harmony. These shales are covered with shells and remains of fishes.

4 Equisetites Infundibuliformis Sp. I have received June 73 a fine stem & part of stem of the species from Mazon Creek. It is in my Collection marked 33 34 Presented by J. J. Stevenson

5 Calamostachys (Macrostachys) Two specimen with a narrow axis 6 millim broad articulations 4 mill distant bearing erect open narrow scales a little more than 1 millim broad long diverging imbricated, brittle, forming an ear 2 ½ cent. broad, the scales apparently linear lanceolat pointed. This may be the same as Calamostachys Johnsonis fig by Geinitz But the ears are twice as broad and more resembling the fragment of the same author named Calamites approximatus, pl. XI fig 4. Another specimen finely preserved of this species No 25a. has the ear 2 ½ cent. long the axis 8 mill thick broad the articulations 5 mill distant. The scales closely imbricated or appressed, united in their whole length, abruptly pointed & thickened on the borders not longer than the articulations, thickly curved outside along the border. The ear is entirely preserved 10 ½ cent. long resembling an ear of Lepidodendron but with the scales all around the articulations and not imbricated in spiral. This ear may be Asterophyllites tuberculata Dl & H. or Asterophyllites Johnsonis Dl & H as figured by Geinitz. It especially resembles the fragment figured by Schimper Pal veg. II XXIII fig 16-17. which he names Macrostachys infundibuliformis and considers as ears of Equisetites infundibuliformis Brgt. copied from Germ Vest. fig 122 = fig 16 & 17 of Schp named by German Huttonia carinata Dig 3 = fig 18 of Schp marked by Gutbier as Equisetum infundibuliformis. Now this ear may be the same as my Asterophyllites tuberculata Lanceolata and apert of the Germ Repat. which have all been found in one rock where

Asterophyllites equisetiformis was very common and where there was not any trace of Equisetum infundibuliformis. Shew from Carnelton where they appear common are also found in shales with the same asterophyllites cuneifolia and longifolia and there is not as yet any Equisetum remains found. Their reference is therefore very uncertain. The form of the scales however does not compare exactly with any of the figures of Schimper and Germar, nor with Geinitz asterophyllites foliosa, which is the same as Wallmannia gracilis, Hemb; nor with Asterophyllites tuberculata of Hull. Hull lists with W. polystachia Hemb. But both Wallmannia major qui commence dit schimper ressemblent a quelques epis de Lepidodendron mais a different par leurs articulations regulieres. La forme de scailles est differente dans notre espece qui devrait aussi constituer une espece nouvelle, celle de Germar correspond aussi a mon Asterophyllites tuberculata de Penn. Report. (1) See p. 427c (3). See Geinitz foot; Thes

1) Asterophyllites gracilis Lesq. Two specimen from Mazon creek got from Thorp. No 1634 & 1635 represent branches of this species. The broader part of the stem is two cent broad; stems irregularly striated or nearly smooth, articulated. articulations 14 millim. distant with opposite or verticillate branches or ears, diverging nearly in right angle, narrow, three cent long, but becoming shorter with each articulation, six in number; the axis is about 2 millim broad, closely articulated, articulation 3 mill distant, bearing a whorl of linear narrow pointed leaflets, either straight out from the articulation or right angle to them or curved up, bearing in the axils four oval mullets alternate at each articulation in such a way that to compress upon the stem there are seen upon the lower articulation and one only upon that above or three on one side of the axis and only one on the other. These mullets are 1½ mill broad and 2 mill long. The leaves at the articulations of the stem are three millimeters long not even half a millimeter broad and of the same length and width upon the articulations of the mullets or upon the ears. This is exactly what I have established as Asterophyllites gracilis. I consider it still as part of Asterophyllites. Then the same character as A. gracilis, differing merely by the double large size of branch No 1635 has the mullets several nearly globular and the leaves somewhat broader and longer and more open. Figure this. I have figured a second specimen from (2) from specimens presented by Dr Britts from Clinton representing a form apparently new Asterophyllites as regulata which has exactly the same characters as A. gracilis (figures) from Alden specimens but which is at least twice larger in all its part. Some specimens appear bushy branching fig 2. with branches irregularly distant, the largest eight millimeters broad at the articulations which are distinctly inflated (1) obscurely striate or rather furrowed, smooth with articulations very variable in distance from three to ten millimeters. Fig. 3 differs by its mode of branching from that of both specimens. There have their branches mostly dichotomous while in fig. 3 they are in a whorl of the leaves or rather opposite has the articulation of the main rachis. More distant from of the branches bearing leaves all of the same as the other specimens or very short. It is not possible to doubt identity of these different specimens as both fig 2 & 3 bear some mullets here and there attached above the leaves or they are seen in three to four mullets long and 3/4 of a millim. broad at the base by 4. The leaves are all of the same type, four and comparatively short, slightly dilated at the base of the whorl box, very gradually tapering to a sharp point, joined at the base and covered at the back by a small inflation of cuticle like a bulbille or mullet fig 1 a. The seeds are at the upper branches as in fig 2 and fall easily as most of the seeds of these specimens fig 2 & 3 are detached; fig 2 has some of them shewn curved upwards

(1) By the inflation of the articulations and the size it differs from A. gracilis. see p. 427c

upon the shale, or closely placed in small whirls of rare. fig 5 which are attached apparently to the sides of the branches by a short curved branch. In the first case the leaves are normal or longer and more distinct; in the second they are short and their points seemingly pressed to the fructifications and scarcely discernable. At seen figs 4a & 4b. enlarged, the seeds are oval narrowed into a point apparently the short pedicel joining them to the rachis. The mode of nervation of fig 2 is not really an anomaly. The branches are really from the articulations and by the abortion of the others they are left single and by compression of growth appear little dichotomous. This is clearly seen in the small species. After. gracilis figured upon another plat. The leaves are obscurely linear nerved upon the back or marked by a blood streak visible upon the back of the branches and stem is striate at least upon a part of the flattened specimen of coal, rather smooth.

1. Asterophyllites foliosus. Gein. N. 3. of Dutts represent a whorl of leaves of this species. It has fourteen leaflets slightly and gradually enlarging from the base to the middle and then gradually tapering to a sharp acumen. Schimper refers this species to Calamites Suckowii Brgt. This is certainly erroneous for that Calamite is extremely common in N. America Coal measures while this A. foliosus is very rare. It is said in this vol. p. 424 that it is common in the concretions of Mazon creek. But most of what I have referred to this species is more evidently related to what Schimper names Annularia Calamitoides.

2. Asterophyllites rigidus. ? Brgt. Specimen 334 of Lacoe Brown Colony represent a Asterophyllite with very close inflated articulations no more than two millimeters distant with whorls of very narrow deeply nerved leaves three to five centimeters long no more than 1 millim broad straight out and nearly at right angles the narrow stem scarcely half a cent broad close and heaped together bottoms with a branch of lepidodendron covered with narrow leaves. This is also apparently referable to A. rigidus. Another specimen with the leaves quite as crowded but erect has the leaves very rigid 3½ centimeters long or more and same width not more than one millim. The articulations are hidden by the leaves.

(3). Calamostachys infundibuliformis. is represented by a large number of specimens and now I believe as Schimper does that they are referable to Equisetites infundibuliformis whose stem has been found at Carbondale in three well preserved specimens of which I have one. The largest specimens of these Calamostachys are 15 cent long. I have figured part of one of the largest on an enlarged scale and one of the smallest. I have still to figure a cross section which I take with me. See Geinitz about Equisetites rigidus which he makes same as Calamostachys. Spec. No. 364 is a fragment of a ramified stem scars 26 mill. wide.

4 Equisetites priscus. Gein. See a large specimen a rather small stem in part of the stalk with very long branches placed star like. This specimen comes probably from the coal but I do not know the locality. Compare Geinitz. not described. Equisetum priscum Gein in Macrostachys infundibuliformis

5. Calamostachys [illegible] Spec. of Lacoe [illegible] (731) Pittsburgh coal. Stem [illegible] lines, long 14 cent. 7 & 8 millim broad when flattened, deeply striated in very 2 mill. distant, linear ribs [illegible] scarcely narrowed at the base [illegible] in the 11 nodal length. [illegible] to doubt the reference of this species to Calamostachys. It positively differs from C. major by the [illegible] ribs the top of the scales distinctly [illegible] and the great length of [illegible] see for this species in its relation to Asterophyllites foliosus p 419 & 1.

427 b.

(1) Calamostachys. Schp. There is evidently many species of this genus. I have four dozen specimens N 212 to 215 and 221 and 222, which represent small ears of this genus, intermediate for the size between C. Suckowiana Schp. Atlas pl XXIII fig. 11 & C typica fig 1 of the same plate. They must resemble by the form the spikes of Calamodendron commune? as figured in Note et. of Binney in pamphlet but an ear 37 millimeters long some a little shorter centimeters broad narrowly oblong oval round pointed at the top narrowed to the petiole with close rows of appressed lanceolat acuminate scales keeled on the back connected or joined by their length or more At should be named. It is smaller than any seen from our Coal measure until now. I have figured N 215 under the name of Cal minor. This can not be a var of C. typica.

Asterophyllites anthracinus Heer Fl. Helv. 3 p. 50 Pl. 121 2-3 Specimen Mar 354. This species agree in the character with Heer's description articulations very close three and an half to four millimeters distant in the whole length of the branch leaves at least twice as long as the articulations linear lanceolat to the sharp acumen, somewhat narrowed at the base, short without trace of medial nerve. Merely differs by the leaves straight, not curved.

This extremely fine and delicate *Lycopodites* may be compared to the upper branches of *Lepidodendron selaginoides*, Sternb., as figured by Ll. and Hutt., vol. 1, tab. 12; and also to *Lycopodites Stichlerianus*, Gopp., Silurian, p 170, tab. 25. In our species the stem is longer, more slender; the leaves narrower and proportionally longer, and the ramification different.

On the roof shales of the coal at Morris.

Genus SCHUTZIA, Goppert, Permian Flora, p. 161.

Stems either single or branching, bearing on short alternate pedicels small cones or strobiles of an ovate truncate form, a compound of imbricate, broadly linear pointed scales, united at the base.

Schutzia bracteata, Sp. nov.

Pl. xxi, fig. 6 to 9.

Stem proportionally thick, smooth, bearing alternate short pediceled cones or strobiles, about half an inch long, enlarged ovate from a narrow base, truncate at the top, slightly turned upwards, placed at the axil of a narrow linear bractlet, about one inch long and curved upwards. The cone is a compound of lanceolate pointed, concave scales, placed in spiral, closely imbricated and pressed upon one another, fig. 7 and 8; covering a transparent, yellowish membrane, formed of small, elongated, equilateral meshes: fig. 9, which enclose or support small granules of opaque, brown matter. These granules, scarcely the one-hundreth part of a millimeter in diameter, are of a roundish, irregular, polygonal form, agglomerated and separating with difficulty. Their size and irregularity of form prevent considering them as spores; they look rather like grains of pollen.

From the great difference in the form of the buds born on the stem, which cannot be accounted for, I think, by difference in maturity, it would appear as if the scape of this plant was bearing monœcious flowers, the ones in strobiles bearing pollen, the other fertile buds. These, as seen in *a*, fig. 6, have the appearance of an inflated receptacle, either naked or bordered at its top by foliaceous, narrow divisions. Two specimens of this plant have been found in the

concretions of Mazon creek, and both present the same appearance. Some plants resembling ours have been described under the generic name of *Antholithes.* But this genus is still indefinite, and the plants referred to it really unknown. I have, therefore, placed this species for description in this new genus of Goppert, as more related to it by some of its characters.

Genus Lepidodendron, Sternb.

Ill. Geol. Report, vol. ii, p. 451.

The species of this genus, as it is well known, are characterized merely by the form of the cicatrices, which have been left by the base of the leaves upon the bark of the trees or of their branches. These cicatrices or bolsters vary indeed in size and also in their relative position, according to the thickness of the different parts of a tree, where they are examined. But this variety is far from being as marked as some authors, who have attempted to reduce the species to two or three, seem to suppose it. In following the course of the development of these scars on long stems of *Lepidodendron*, from parts measuring at least one foot in diameter to the smallest branches, they may be seen to vary in size and position according to the degree of activity of the vegetation at different times, and also on account of some irregular mode of growth; but their essential characters, viz.: their outline, the position of the vascular points, as also the form of the leaf scars surrounding them, is generally preserved and recognizable in the whole length of the stem. It is argued that for the genus *Lepidodendron*, we should have too large a number of species if we would consider the scars as specific characters. But the genus *Sigillaria*, so admirably studied by Prof. Brongniart, and after him by the most careful Palæontologists, especially by Goldenberg, whose acuteness of observation is beyond question, has a number of acknowledged species, at least double of those of the genus *Lepidodendron.* Goldenberg describes sixty-seven species of *Sigillaria!* and yet the specific characters are taken from the same vegetable organs, or from the cicatrices of the bark, which are certainly as much subject to variations in *Sigillaria* as in *Lepidodendron.* Why, then, deny the value of the species of one genus, and admit the reality of those of the other. The most marked species of *Lepidodendron* of our American coal fields, *L. modulatum*, *L. giganteum*, *L. clypeatum*, *L. vestitum*, *L. distans*, published in the Geological Report of Penna., have been found over the whole extent of our Coal Measures, and are recognized everywhere by their distinct characters from the form of their cicatrices. In collecting specimens on shale, for the State Cabinet, great care has been taken in comparing the largest possible number of specimens of the same species at the same place, not only to obtain the different

See synonimes in Schimper. & following his nomenclature

1. Lepidodendron rhombicum Gres. I have a large number of small specimens, I can not refer to this species as well as to L. angulatum and perhaps L. quadratum as figure in Hernb. 2 pl. 68 fig 18, 17 & 19. Branches narrow & rarely covered with compressed leaves that are channeled, lanceolate bearing veins, narrow & long, about one inch long & rigid and shorter. The leaf scars often undistinct, circled appressed with a central point. Cicatrices in the decorticated stems & branches are the same as to the second species. all the specimens from Bear Branch of Casey Ky.

2 Lepidodendron marginatum Gres. Stems as at pl. 68 fig 16. Leaves curved & narrower longer than in the former sp. areas prominent, distinctly nerved. Cicatrices as in the former sp. but smaller. Bears a small scar which disappears when the cicatrices become larger. see figure 4 pl 52a.

3 Lepidodendron elegans Hern. Leaves longer than in n° 1. curved inward in the same way but not quite as much, more rigid, deciduous. Stem specimen n° 51 from Mt Sterling it is always associated with Lepidophyllum brevifolium Lesq.

4 Lepidodendron quadratum Hern. A small specimen L 37 with thyrsus loc.? is exactly the species as fig. Hernb. loc cit. pl 68 Fig. 19.

5 Lepidodendron Hernbergi Rog. numerous specimens especially from Morris, Stems with leaves as also stems without and with large scars = L. rugosum Sandberg.

6 Lepidodendron undulatum Lesq. is a species intermediat between L. Hernbergi & L. aculeatum Rost. From the former it differs by its caudex, by undulated & and from the following to which it most resembles not by its broad cicatrices and the vascular scar placed higher. These scars are also smaller and of a different form.

7 Lepidodendron aculeatum Hern. Good and well preserved specimens of this species both corticated and decorticated. One of our specimens L. 99 shows it still with the leaves, though the scars are already large 2 centim. long and 8 millim broad. These leaves are rigid exactly straight, horizontal to the stem or nearly at right angle, narrow, two and an half millim, channeled, with a thick medial nerve, more than 16 centim long, as much as can be seen from another specimen from Newport L. 116 a remarkable specimen. We have also specimens decorticated Lepidodendron appendiculatum Kumb. and one L 118 which is exactly like L. caudatum in Hernb Pl 68 fig 7. I refer L 122 to the same species on account of the leaves rigid &c. of all the characters of this species. The species is common in the anthracithe of Penn.

8 Lepidodendron Morrisianum Lesq. Third. P. 430 pl 22 fig 1 & 2. We have only the leaves of this species but they are very remarkable and easily identified. The figure which I gave of these leaves (enlarged) loc cit. fig 2. is not good. The leaves are very long. more than one foot. (none is seen to the point from the base) 5/8 millim broad. six nerved, or rather three veined on each side of the medial nerve, these being on each side of the medial nerve first a vein and then a bend of folding, with one vein on each side preventing the appearance and section of three veins. The appearance of these leaves as flattened is extremely variable and I have not seen as yet capable of ascertaining its change. Near the point of the leave the medial nerve is obsolet and has two broad nerves on each side. about as figured in the report. specimen L. 95 has with many leaves, some scars referable to L. aculeatum but their leaves do not belong to it: there are other leaves of the same character as those of that species. See Roehl. Foss. Fl. pl 18 pl X1 fig 2 and specimens as Lepidodendron dichotomum with conspicuous leaves as in my L. rigidum & L. nervosum Sternb.

9 Lepidodendron politum Lesq. The Geol Rep. of Ky see description Distantly related to L. Hernbergi but very distinct and well named being entirely smooth. The three vascular point are very broad.

10 Lepidodendron simplex Lesq. It may be L. dimosum Hemb. but it differs by the characters given in the Ill. Report. I consider the Decorticated or Lepidophloios specimens L 92 as the same though I can not see evidence of it. The cicatrices are merely marked in obscure outline with a nearly continuous

ridge and more elevated oval points marking the place of the vascular scar. These oval narrow protuberances are slightly emarginate in the middle see 430 & 4.

D 11 Lepidodendron obtusum Lsq. nothing to add to fig. & description Rep Geol Penn. 1875 Pl. 16 fig 6. The species might be compared only to Lepidodendron aculeatum Sternb. differing however very much. The vascular scar is nearly in the middle, pointed in both sides or ends. Generally this scar is marked at the upper part by a deep depression a point which is not marked upon the figure which is badly made. The species which I have named L. conjunctum and also poorly fig: in Rep Penn. Pl XV fig 3 is referable to this species it is corticated and not marked by two points at a distance from each other, one depressed and one upheaved. In this species the vascular scar also nearly in the middle therefor this species is doubtful and may be referable to it.

D 12. Lepidodendron distans Lsq. Rep Penn. p 874 Pl. XVI fig 8. This species may be referable to Ulodendron or U. ellipticum or U. elongatum as it bears irregular ridges like the specimens of these species. The specimen however fig 8 has the cicatrices perfectly distinct, far larger than in any of the largest specimens of Ulodendron and Lepidodendron aculeatum foss. pl 16 fig 4 which is evidently the same species. but of which the museum has no specimen has still larger cicatrices. It appears however that the distance between the cicatrices is of no account as a character. In one specimen of the Museum, L 31. which has prints very small, on both sides of the same piece, through two different pieces of bark, on side has the cicatrices merely separated by the narrow ridge while on the other side they are separated by a wide smooth space as in Lepidodendron distans. [illegible] belong to the species. [illegible] specimens [illegible] same species, [illegible] [illegible] [illegible]

D 19 Lepidodendron clypeatum Lesq. Penn. Geol. Rep. p. 875. pl. 15 fig 5 & pl. 16 fig 7. The fig. 5 is good enough but the description is very poor. The specimen represent the cicatrices under various forms which must be described from good figures. The species is good and the description is equal that one specimen show at one corner an obcordate cicatrice at the point of which the leaf scar is placed. This leaf scar is nearly equilateral with point upward the 4 angles obtusely pointed, broader than longer. The specimen is covered by two layers of superposed bark showing scarcely any outline of the cicatrices under them and marked only in the middle only by an upraised broad short line or mamill. Corresponding with the base of the leaf scars. Schimper compares this to L. obovatum with which the species has no relation whatever. However Roehl in Foss. vol 8 pl. 1 tab 8 fig 8 figures a Lepidodendra which has some likeness to ours under the name of Lepidodendron Sternbergi: L. obovatum Sternb.

D 20 Lepidodendron crenatum H. Good specimen of this species. L. 56 & L. 64

D 21 Lepidodendron Calyptium? Lesq. ? Spec. 20 b. A remarkable form. The general cicatrice is rhomboidal with sides nearly equilateral and the base acute at the top, upraised see figure p. 529 f. 7. ? L. tabulatum Wms from?

D. 22 Lepidodendron dilatatum L. & Hutt. The museum has a small specimen L. 42 referable to this species as figured by Roehl. Foss. 13 tab 8 fig 4. This a mere copy of L. Sternbergi

23 Lepidodendron Species propria? Specimen L. 79 representing a branch with oval enlarged emarginate scars with the vascular points of a Sigillaria, appearing at some place in an horizontal position, at some other very irregular in their relative position except in a spiral very oblique direction to the right. See figure p. 529 fig 8. 1 & 2 & 3 enlarged. It is related to the species from the Old red of Gaspé.

Rem. on species of Lepidodendron.

L. Fossilmanianum H. is much like my L. turbinatum in Pl. Foss. Rep. vol 2 pl. 12 f.

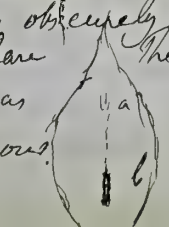
L. Fijeni Lesq. in this vol is the same apparently as the one published in Foss. pl. 68 by Roehl pl. 6 fig 7 which he considers as a var of Lepidodendron caudatum Wms: which Schimper refers to L. aculeatum Sternb. It is rather like L. affine Sternb. pl. 68 fig. 9.

D 24 Lepidodendron Sigillarioides Lesq. Penn. Rep. pl. 15. fig. 6. The specimen L. 22. on which the species was formed may represent some common species however exactly copied.

Del. 25 Lepidodendron? branch L. "Fine branch S. L. marked with obscure cicatrices and apparently referable to Lepidodendron. It is one foot long, 3 inches broad, cylindrical, enlarged at one end as if from a root or from a defective and marked by spiral linear impressions as by the twisting of rootlets or the gang of worms."

20 b L. crenatum H. Specimens, cast and figures sent by M. Southwell are referable to this species see letter copy book 6 pp. 75.

26 Lepidodendron aculeatum? Lesq. At least I think it is the species which I have named thus in Penn. Report. The petioles are longer and narrower than in L. obovatum, largest in the middle with a long acumen at both ends an exactly rhomboidal scar with large appendages on both sides and three large vascular points. The bark is thick, 1 mill. its surface marked the outlines of the petioles obscurely marked under it bearing an elongated oval scar towards the base. The upper scars is scarcely visible. The lower one to be very distinct as in b. Appears a good species. The petioles are contiguous.



429a. Distribution of the Genus Lepidodendron, Brongniart remarks in mem: of Grand Eury p. 6. that the Lepidodendron are nearly totally absent in the St Etienne basin; very rare at Rive de Gier which is however lower and that they characterize the ancient and middle coal formations.

D1 Lepidodendron aculeatum Bry. Under N° 23°. the specimen with cabinet has a L. with very long, 4–5 cent., bolster comparatively narrow long acuminate at both ends protuberent in the middle (see p. 531 fig. 15) or along the middle line, undulately marked on both sides in the lower part with the middle somewhat low or near the middle of the bolster and marked as in the figure the appendages are distinct, the points of the vessel obscure. The specimen is covered with long ligne, ½ cent broad, convex on one side, canaliculate on the other marked in the middle by three veins or more the side veins being double or at least thick. These lines are like those of Lepidodendron ryeum but not so straight their point of attachment to the bolsters or scars is not visible. The central scar however have the same size as the lines and then appear as evenly separated from them. – Sous N° 39 il y a à la même collection un bon échantillon de L. undulatum avec la même gene de feuilles figure semblable presente la même forme, appendages etc. la difference essentielle dans la position des bolsters, contiguous in the first specimen N° 23°. separated in the second N° 39. they may be separated or united. If united this species is near L. obovatum rarely. The undulation of the intervening borders as just as those published them. I The N° 23 should rather be referable to L. aculeatum Sternb than to L. obovatum. Ho

D2 Lepidodendron with the creeping stem (souche) of Lepidodendron Sq 1640. should be described if possible

D3 Lepidodendron (Sagenaria) Veltheimianum, Gopp or Sagenaria Veltheimiana as figured by Sternb. II LVIII fig 2 vol 2. it apparently represented upon small specimen from Mazon creek. Le 1668. It agree also with the short description given of Lepidodendron Veltheimianum by Schimper Pal vegt. p. 23. However the cicatricule is rhomboidal, not semilunar and the cicatrices pulvinus are not surrounded by a round border. It is also somewhat like L. verbinatum of the N° Rep II. I consider it as a new species

D4 Lepidodendron Sternbergii or L. rugosum. Specimen No 291 – flattened branch like an internal flattened mould it marked on both side by cicatrices like those of L. Sternbergii, more elongated on one side of the branch than on the other, all covered with a thin coating of coaly matter and some of them mostly effaced. These are marked in the centre or just below the vascular cicatrice, and the point where the cauda originate (genus it) by an elongated split, ½ like this. The split is central, even lower than the middle. On one of the bolster it is marked by a small mamilla, so like this or smaller, upraised.

D. 3 Lepidodendron [illegible] ... [illegible]

parts of a plant, but also to carefully note the variations of the same plant under different circumstances. In this way it has been possible to ascertain the reliability of some doubtful species of *Lepidodendron*, and to unite in one some parts formerly referred to different species or even to different genera.

Lepidodendron rigens, Sp. nov.

Pl. xxvii, fig. 1 to 3.

The concretions of Mazon creek, which have generally preserved plants or their parts in their integrity, without deforming them by compression, have furnished, among other very interesting specimens, the branch of *Lepidodendron* which is copied in our figure. It shows distinctly the bolster, the point, and mode of attachment of the leaves, around the leaf scars, and the vascular vessels, or bundles, in their disposition in passing from the stem to the leaves, as in fig. 2. At the same time it proves that, in some species at least, the leaves of *Lepidodendron* were inflated, or somewhat cylindrical in their whole length, as marked in fig. 3, and not flat, as they are generally seen on the shales. These leaves were not hollow or tubulose; they are too stiff for that in this species at least, but were probably filled by cellular tissue traversed by three bundles of vessels. The form of these leaves does not appear to be exactly like the outline of the leaf scar, as they seem to extend and become flat on the sides in joining the scar, fig. 2, and in the cross section, fig. 3, enlarged, the leaf does not indicate any angular compression on the sides. The bolsters of this branch have not yet their definite form, and therefore the specific affinity, considered from these characters, can not be satisfactorily recognized. The narrower leaves and cicatrices distinguish it evidently from the following species, which it resembles by the length and straightness of the leaves.

Lepidodendron Morrisianum, Sp. nov.

Pl. xxii, fig. 1 and 2.

The cicatrices of this species are of three kinds. Under the surface or true cortex, they appear slightly upraised, like those of a *Knorria*, upon a short pedicel which is enlarged downwards, rough on the sides, with a flat rhomboidal top or leaf scar, marked like that of the surface by three vascular points, fig. 1 *a*. The surface cicatrices are broadly rhomboidal, with the opposite sides nearly parallel, curved outside and the leaf scar placed near the top, rhomboidal obtuse above and below, acute on the sides and marked by three horizontal large vascular points. The medial line of the bolsters is merely indicated by two or three horizontal wrinkles, enlarged in the middle. These cicatrices of the surface, when covered with the base of the leaves and their coat of coaly matter, appear hexangular, fig. 1 *b*. The leaves one foot long or more, one and a half line broad when flattened, are sharply marked by three vascular lines and narrowly, regularly striate on their surface, formed of a pellicle of coaly matter as thick as a leaf of paper, fig. 2 enlarged.

The tubular form of the leaves of some *Lepidodendra* is visibly marked in this species, for it is only by considering them in that way, that we can account for the difference remarked in the relative position of the vascular bundles when the leaves are flattened, for they appear on our specimen either central or lateral or single, double, triple, according to the plan in which leaves have been compressed. This fine specimen from the roof shale of the coal of Morris was communicated by Mr. J. Even. It now belongs to the State cabinet.

Lepidodendron modulatum, Lesqx. Geol. Rep. Penn., p. 874.

Pl. xv, fig. 1.

In the shales at Morris, by Mr. S. S. Strong. It distinctly preserves its characters, though the cicatrices are small. Found, also, in concretions at Mazon creek.

1 Lepidodendron modulatum Lsqx. On the same specimen from Carbondale and seeming to cover the Lepidodendron, there is a large part of the shale bearing the rootlets of Caulopteris obtecta Lsqx. They can not be referable to the same. But the relation is remarkable especially so if it is casual.

2. Lepidodendron morrisianum is a Lomatophloios like the new species of Penn: Ma. 21.

3. Lepidodendron modulatum Lsqx. is as said p. 428c (6) intermediate between L. aculeatum, St. & L. Sternbergii Brgt. which = L. obovatum St. — L. rugosum Presl in St. LXVIII f. 4 & fig. 6. by its longer more prolonged cicatrices attenuated up and down in a long curved caudal tail. In this it is matched L. aculeatum from which it differs by the pulvinuli placed lower or nearer to the middle, the constant border which surrounds the scar. The different forms of the pulvinuli. In this species the wall or bark is thin, distinctly & deeply and regularly striate in the length, the lines being parallel, half a millimeter distant. The cicatrices however vary. sometimes broader sometimes narrower; but the curved bar and top and the pulvinuli are constant characters. See p. 430c-1.

4 Lepidodendron simplex? Lsqx. A few small specimens, No 1589. from from Nauvoo Coal. Penn: represent cicatrices 17 mill long. 4 millim broad in the middle. where they are broadest, with a pulvinulus exactly rhomboidal ◇ obtenat the four corners, comparatively large placed in the middle of the cicatrices with have the lower part flat, not carinate and a mere trace of depressed line or furrow for the cauda. The vascular points are in the middle of the pulvinulus, three very close, the middle one a little lower or somewhat obsolete appendage none. The pulvinulus (the middle is two and one half millim. each way between the corners. The wall surface or bark covering the ~~scar~~ cicatrice is comparatively thick, thicker than in the former species and totally smooth and polished. The cicatrices are separated by a double border with a groove in the middle) one to one and one half mill meter broad. This species much resembles L. simplex of the 2d rock of the Coal report and appears positively different from L. rimosum, as fig. 6 certainly though the difference relation is great. The pulvini are flat not carinate; the central pulvinulus is obtuse at the 4 angles of an equilateral rhomb. Another specimen No 1593 which is apparently referable to the same species has the cicatrice either contiguous only limited by an upraised narrow border or has them separated by a depression as broad as the ridges in the spec. No 1589. In this also (1593) the central pulvinulus is enlarged on both sides which are acute while the upper and lower ones are rounded ◇ the vascular points are however in the middle and there is no trace of appendage and no cauda. The ~~scars~~ cicatrices as in the other specimen are shorter and broader than in L. simplex. However & there it is the same species. The bars are narrow though not as narrow as in L. simplex, carinate (deeply with two lateral nerves one on each side of the carina. I have seen also specimens of the same species in nodules of Mazon creek at Joliet (1876). One of

them has the bolsters separated by flat borders with ridge also flat
The pulvinuli are of the same form as in my specimen of the species. with
vascular points effaced. The cicatrices are three centimeters long
eleven millim. broad. The other specimen has the bolsters only three
cent long and 12 millim broad with the pulvinuli much larger
and more deeply marked. and the bolsters separated by four
five narrow sharp and deep ribs which mark the whole surface
as undulately ribbed in the length.

1. Lepidodendron modulatum Lx. type. Ma 365 is a fine branch.
39 cent long, 3 1/2 cent broad with scars only 1/2 cent long showing the
characters indicated by the species. The borders of the scars are either round
or flat, more broader when flat but distinctly characterized both
ways. When the borders are flattened and enlarged the cicatrices or
bolsters represent well enough Lep. concinnum Ph. Ill. 6 a figure.
Both with flat and round borders cicatrices are upon the same
specimen.

Q. Lepidodendron Rufsfolium, St. acus Stbg. [illegible] of
[illegible] with the specimen preserved, long 11 cent or more very narrow
[illegible] with deep median groove [illegible]
[illegible] to the fig. of Ph. III. pl. 161. [illegible] one, very crowded and
[illegible] One of the specimens bears a long cone with [illegible]
[illegible] Lepidolepis Carbonaria.

[illegible] 2 1/2 cent long 1 1/2 cent broad with [illegible]
[illegible] and thick bark, not often distinctly [illegible]
[illegible] cent long. Cicatrices [illegible] The scales cohering in [illegible]
[illegible] strata. Large fragments seem to belong to the same species
[illegible] with the fig in the margin. (Refer to de Morrichia).

[illegible] Lepidodendron. Of these specimens [illegible]
[illegible] the cicatrices [illegible] the bolsters [illegible] or narrow [illegible]
[illegible] the middle [illegible] cent broad [illegible]
[illegible] cicatrices [illegible] about 1 millim. [illegible]
[illegible] Stigmaria [illegible] Ficoides [illegible]

See - p 4316.1.

5. Rhipidodendron [illegible] specimen about 3½ long [illegible] 1 [illegible] 30 cent round, 50 cent long, tattered [illegible] 10 cent [illegible] upper surface [illegible] [illegible] [illegible]

Comparing my figure with Heer's species, I find it somewhat like that of Lepidodendron crenatum as figured in Heer I, pl VIII fig. A 1. Differs however by the bolsters somewhat larger, wrinkled above and below the vascular cicatricule and separated by a flat broad margin 4 mill. broad wrinkled in the length. Comparable to L. Weltheimianum as figured Pl XX figs 1–4 & 6. but where the bolsters are separated by flat margins. But in all these forms there is no trace of wrinkles or wrinkled canda either below or above the vascular cicatricules. The reference of the specimen is therefore uncertain between L. crenatum & L. Weltheimianum.

1 Lepidodendron Weltheimianum St. I have figured sketches of two very fine specimen of the species, Lacoe 24 & 26. p. 546 f. 15. a. b. The bolsters are very clear, predominant or deeply moulded; the rey. from the top of the bolsters to the top of the central pulvinet is sharp and elevated gradually; the tail distinctly wrinkled acron. the three vascular scars close and at the base of the pulvinet. See figure. They evidently represent the species like those mentioned 430 c 4. Another specimen is of the same fig. copied from Lacoe 717. it is the same form exactly as that figured by Heer Arct fl. I Baeren Island pl VIII f. 2 the scars being only a little larger in Lacoe specimen. It is also comparable to the scars of L. commutatum Sternb. and as Heer refers Ulodendron to Lepidodendron Weltheimianum these might also be referred to the same.

LEPIDODENDRON FORULATUM, Sp. nov.

Pl. xxiv, fig. 5 to 8.

CICATRICES distant, oval, narrower and pointed at both ends, wrinkled across; leaf scar large, central, marked with three distinct large vascular points, without medial line or appendages; corticated surface deeply undulate-wrinkled lengthwise, marked by deep, narrow, equally distant furrows, separating the cicatrices in vertical rows as in the genus *Sigillaria*. The decorticated surface, fig. 7 and 8, is regularly striate lengthwise by narrow, nearly straight wrinkles, and has its cicatrices upraised or convex-rhomboidal, split from the central point downwards, by a deep narrow line.

The peculiar furrowing of the surface of this species does not appear merely casual. A disposition of this kind has already been observed, though not quite as distinctly marked, in *Lepidodendron costatum*, Lesqx., described and figured in the second volume of this Report.

Found at St. Johns, in the roof shales of the main coal.

LEPIDODENDRON TIJOUI, Sp. nov.

Pl. xxiv, fig. 1 to 3.

CICATRICES of the cortex proportionally small, ovate, long pointed at both ends, separated by a flat irregularly wrinkled border, about one line broad; leaf scar large, placed above the middle, smooth, marked by its three vascular points, without medial line or appendages; cicatrices of the decorticated surface of the same form, smooth, merely marked in the middle by a vertical line, fig. 3, (3*b* enlarged). A small piece, fig. 2, of the same, though taken from the largest part of the tree, preserves the form and distance of the cicatrices as in the specimen of fig. 1. The coat of coaly matter covering the surface is thin, smooth, and the place of the leaf scars is hardly indicated on it.

The specimens of this species were found in connection with the *Lepdiophloyos auriculatum* and its *Lepidophyllum*, as seen in fig. 1, in the roof shales of the main coal of St. Johns. Dedicated to Mr. Thos. Tijou, superintendent of the coal mining company, Duquoin.

Lepidodendron mammillatum, Sp. nov.

Pl. xxv, fig 1.

General cicatrices marked obscurely by an irregular narrow furrow, obtuse at the upper end, narrowed downwards into a caudate curved point, central scar round, mammillate or convex, notched at the top, or with irregularly undulate borders. The specimen represents the decorticated part of the species, and does not indicate any trace of leaf scar or of vascular points. The surface is deeply and irregularly grooved, the grooves passing in undulations between the cicatrices.

Found in large specimens on the roof shales of the coal at Morris.

From specimens obtained two late for the plate, the species shows the character of a true *Lepidodendron*. The cicatrices are broadly oval, pointed at both ends, the leaf scar is of an oval form, enlarged on the sides or horizontally marked with a large medial vascular point and two lateral ones, placed at the corner of the leaf scar under which is an oval convex bolster. This bolster is the only part left of the specimens where the surface is old or eroded, as seen in our figure.

Lepidodendron cruciatum, Sp. nov.

Pl. xxv, fig. 2.

Surface furrowed by deep, irregular grooves, diverging from the scars in quincunxial direction ; cicatrices distant, deeply cut in the shale, but irregular and variable, generally oval and narrowed downwards. The supercortical layer of coaly matter is very thick, one line at least, deeply, narrowly and regularly striate, filling the depressions or hollow scars, and obliterating their forms.

The specimen from which the figure is copied, is large, and apparently represents the base of a tree whose bark has become roughened by age. The species is uncertain and not satisfactorily known.

Roof shales of the coal at Morris.

1 Lepidodendron crucicatum Sy. Mag. is a fine better specimen. It should be drawn. The bolsters are oval elongated marked near the top with a round scar and a central vascular scar. Some of the bolsters seem to have two lateral scars like those of Sigillaria. The specimen should be studied and found in a better state of preservation, if possible. See if this was not published in Wood's pamphlet.

Lepidodendron? Greenii, Sp. nov.

Pl. xxvii, fig. 7 and 8.

Cicatrices distant and deeply marked, oval in outline, pointed at the top, rounded at the base, marked under the point by a round, deeply sunk leaf scar, bordered by an upraised ring, and marked by a single central vascular point, thus resembling the scar of *Syrigodendron*.

From the great distance of the cicatrices, which are placed in a quincunxial order, and from the form of the leaf scars, it is presumable that this species may belong to another genus, or that it is the type of a new one.

Found by Mr. H. A. Green, in Mercer Co., Ills.

Lepidodendron rugosum, Brgt. Brod., p. 85. = *L. Sternbergii*,

Little Vermilion; Dr. J. C. Winslow.

Lepidodendron gracile, Brgt.

Veg. foss., 2, t. 15?

Lepidodendron elegans, Brgt.

Veg. foss., 2, t. 14?

In the roof shales of the coal of Morris and of Colchester, there is an abundance of small stems or branches of a *Lepidodendron* covered with short, linear, lanceolate-pointed, flat leaves, referable, from the figures given by the author, to the above-named species. These are considered by more recent authors as identical with *Lepidodendron abovatum*, Sternb., the form of the cicatrices being alike, and differing merely in size. *Lepidodendron abovatum* is also found at Morris and Colchester with large cicatrices.

Genus ULODENDRON, Rhode.

Beitr., Pl. 3, fig. 1, Endl. Gen., p. 70.

Stem arborescent, simple,? covered with rhomboidal cicatrices, remains of deciduous, strobile-like branches, densely covered with imbricate leaves.

This description, translated from Unger's Genera, p. 262, does not give a clear idea of the form and nature of the trees referable to this genus, for the good reason that now, after years of research among the remains of fossil plants, these species are known to us by mere detached fragments, whose relation is uncertain. Prof. Brongniart has considered this genus as merely representing species of *Lepidodendron*, and this opinion has been more or less generally admitted by others. And truly, the bark of the trees or of the species referred to this genus, bear cicatrices or bolsters generally of the same type as those of the true *Lepidodendron*, with also the leaf scars and vascular points of the same kind and placed in the same position.

They differ essentially in this: that they have two or more parallel rows of large round or oval scars, which appear as if they had been made by the base of large strobiles or cones, thickly covered with scales or short leaves. These organs have not yet been found in connection with trunks or branches, and therefore their origin is hypothetical. They have been considered either as the cicatrices of a peculiar kind of leaves, a supposition which is not admissible, or as the scars of lateral abortive or adventive branches, a supposition also unsustainable for vegetables regularly dichotomous, like those of the genus *Lepidodendron*, or as the scars of large strobiles like those of our *Lepidostrobus princeps*, (this Report, vol. ii, pl. 45, fig. 1) whose size corresponds with that of the cicatrices, and prevents the idea that they may be borne at the top of the slender branches of *Lepidodendron*.

I consider this last supposition as the right one. These scars, one or two inches in diameter, are placed in parallel rows, alternate or opposite to each other, at a distance varying vertically from two to eight inches. It is possible that these organs were borne on peculiar fruit-bearing branches of species of *Lepidodendron*. The horizontal distance between them is not great: 2 to 3 inches. What seems also to indicate *branches* is the small size of the cicatrices of the bark, which in all our specimens is about the same. There is, nevertheless, a peculiar character remarked on the specimens of all our American species, which is not observable on the bark of species of *Lepidodendron*. Their surface is ribbed lengthwise by irregular ridges, from one-fourth to one-half of an inch broad, one to two lines thick, generally angular at the top, bearing be-

Ulodendron. Schimper mixed Ulodendron in a bad way. I have arranged the specimens of the museum according to my descriptions in this vol. It is possible that Ulodendron elongatum would be the same specie as U. Elegantius as the large spec: U. 23 is equally referable by its scars to both. The leaf scars being contiguous and some of them distant. But I doubt that U. elegantius & U. pendulum could be considered as the same. We have good specimens

91. Ulodendron minus. St & Hull. I refer to this species a fine small specimen N. 37 which has leaf scars exactly well definite resembling those of Lepidodendron monadi. Brandt. fig. 16 mutilus. with a matrix covered by obovate scales. Above described. It is similar small specimen. It is apparently the same as specimen U. 32.

A specimen of U. minus is described from Mont Valle coal mines Ala. CB pg N° 10 I have another from N. Alabama, which is perhaps a fragment of the same but of a larger part of the stem. It is 40 cent long 15 cent broad, flattened to a thickness of 5 cent. The scars are nearly contiguous, some quite contiguous some half a centimeter distant exactly round, 43 millimeters both way. The characters of the ~~leaf scars~~ are as ~~described above figured~~. It bears 5 ear scars on one side and six on the other. No part of it is bleak

Al. 88

Another and very remarkable specimen of the same species a flattened branch four and an half centimeter broad and ~~twelve~~ five and an half centimeter broad where it branches or forks, being dichotomous. The leaf scars are evidently quadrangular or rather ◇ exactly rhomboidal with the vascular scar at the top. The size is the same as in the specimen which I have figured or three millimeter each way while in the large specimen from Marsh these scars are 5 millimeter. The ear scars are contiguous, it is a length of 12 centimeters, one centimeter broad. The surface covered with a shining coating of coaly matter and the structure of the scars ~~scarcely~~ distinguishable. The specimen where it branches has been compressed and the ear preserved, is part only, its lower part on its bar nearly two centimeter broad, composed of long imbricated linear scales, two millimeters broad many tubes, closely appressed and imbricated. Lanceolate acuminate, about one cent long as far as they can be seen. The rhomboidal base however is distinctly visible across the superpose blades which are here and there destroyed or abraded. This specimen is very interesting. The specimen should be figured Its nearest specimens are the scars distant as in those figured by Schimper in his pl. 64 fig. 1—3. I have never seen them also variable in size as in Lind & H. fig. vol. 1. ~~pl.~~ pl. 6 copied by Schimper

from 435b.

less developed and a close examination of the disks reveal the fact that they are like those of the borders mere undeveloped & abortive branches and not the impression of disks of ears as seen in some Ulodendron. The leaf scars are however exactly those of U. majus Dr. & Hut. by all their characters, being transversely rhomboided with an oval & nearly round ring around a single central vascular scar just as marked in this vol. Pl XXII fig. 4. I consider this as possibly identical with Ulodendron majus, at least in its young state. It is however not well possible to compare the scales left upon the discs of Ulodendron to the impression of abortive branches and still more difficult to admit the regular position of these branches either alternate or opposite in vertical lines upon the trunks. This however is not more difficult or hard to understand than is the same position for ears of fructification and I must say that most of the disks which I have had opportunity to observe in large number have the surface covered by irregularly disposed scars which may quite as well represent abortive leaf scars disfigured by age and compression as barren scales of fir cones. The question is then still unsettled. One specimen however give evidence to the presence of buds of branches exactly represented as they are seen upon its border and at the top of the division where they it enlarges somewhat and is apparently stopped in a new subdivision by a number of these adventive lobes which terminate it like lobes. The specimen is an impression into Cannel Coal. It is very distinct in all its parts. - I should be disposed to consider this fragment as of a young creeping stem. Its flexuous form seem to indicate it. It may have been in the swamps of the carboniferous other kinds of floating stems besides those of Sigillaria and it may be that many of the Lycopodiaceous species which are represented in the coals as erect are on the contrary horizontal or floating by stems. This might explain the peculiar disposition for form per example of the branches of Megaphytum Lepidodendron Gaffordi, however offers an analogous kind of disposition of the fronds all around a stem and therefore can not be floating or creeping stem. I have seen (Ulodendron thumbi) of Lepidodendron with scars on both sides of the stem.

D 1. Ulodendron majus. Ll Ll. N. 7. Aldrich has from Monteralls a fine specimen referable to this species. The strobil-or branch scars are large, nearly round not quit three cent: distant, 4 ½ cent long and 4 cent broad irregularly marked by circumtical rays or rather rugosity of the surface, slightly convex and also slightly umbonate in the middle. The leaf scars where the surface coating of coal is rather out are little thon of Pl. XXII fig 4b of the vol.: the surface coal being marked obscurely with their outline and a point in the middle differing therefor of fig. 6 of the same plat. The pellicle of coal is about ½ mill. thick. The specime 26 cent long ten three and an half branch scars. and is indeed very fine. His however narrow and it is not well possible to see if the costæ are marked upon the trunk.

D 2 Ulodendron commutatum Schp. Pal. regt. II p 40 Schimpers describes quite exactly under this name a species of which we have two large fine but somewhat brother specimen from Monteralls Coal mines N. 884. The trunk is not large: perhaps the specimen represent branches or young stems 19 cent wide, flattened to about 5 cent, irregularly costate, the whole surface covered with a shining thick coating of coal, twice or thrice as in the former species. Leaf scars ◊ rhomboidal elliptic, circumnat at both ends, somewhat more enlarged on one side than on the other in the middle, ◊ longer than broad, convex carinate with a slight oval cicatrice at the top and a vascular point in the middle. Leaf scars large, grand oval, a little longer than broad. Top centimeter long, four and an half to five cent broad exactly marked either by the impression of the leaves (cicatrices) scars of leaves somewhat more observed than upon the surface of the trunk and disposed in spiral. See Schimper about this which is a good species intermediate between U. mirus & U. majus. The distance between the scars is greater than in the first and less than in the second. In a smaller specimen where the ten scars on 4 cent long the distance between them is the same.

D 3. Ulodendron Mansfieldi sp. nov. See fig. from spec. N. 790 Mansfield. Stem slender and flexuous, 22 millim. diameter dichotomous. discs round, dimall, 1 cent diam, and deeply cut into the stone by impression or half globular convex. four to five millim. high upon the stem of which the impression is preserved into the coal (cannel) comparatively distant three to four and an half cent distant from center to center, inordinate or without regular position as seen in the figure, mostly in the middle of the stem or at its borders: with obscure traces of impression of scales toward the circumference. The stem is marked on its borders by small abortive dichotomous branches in a, more or

tween them flattened furrows, or strips of true bark with its cicatrices. The irregularity of these ridges, which vary in size as well as in their respective distances, being sometimes close to each other, sometimes a few inches apart, contradict the supposition that they are a kind of organism resulting from the normal growth of the trees. They are mere excrescences, similar to those which are seen on old trees; for in some places, by the expansion of their borders they cover part of the scars, in some others they push them aside, as from the enlarging border of a split. When supercorticated, the surface of the species of this genus between the top of the ribs, is filled by a coat of carbonaceous matter, half a line to one line or more in thickness, in such a way that the surface of the coat of coal is on a plane with the ridges, and that consequently, the coal is thicker in proportion to the depth of the grooves, as seen, pl. xxiii, fig. 1.

The surface of this coaly matter is smooth, striate lengthwise by narrow parallel lines, and the position of the cicatrices of the bark and of the leaf scars is merely indicated by a slight depression, with a point in the middle. The peculiar nature, or rather the mode of formation of this supercortical coat of coal, which covers the surface of the plants now examined, as also of most of the species of trees found in the shales and in the sandstone of the Coal Measures, is not explained. It is evident from what is seen on our specimens, that it does not represent a true cortex, but that it is rather produced by some exudation of matter (ulmic acid?) forced, by compression, during the process of maceration and carbonization of the plants. This supposition, however, does not account for the peculiar marks left and defined upon the surface of this matter, and different in each species.

435 1/1

Ulodendron majus, Ll. and Hutt.

Foss. flora., i, p. 22, t. s.

Sigillaria Menardi, Lesqx.

Ill. Geol. Rep, vol. ii, p. 450, Pl. 43.

Large and numerous specimens of this species, obtained from the shales at Morris, have afforded opportunity of studying it under various appearances, and of recognizing its identity with the species described and figured by Lindley and by Sternberg. Though the cicatrices are most of the time obliterated, and their outline modified, some specimens present them in their primitive forms, with the essential characters, the three-pointed leaf scar of the genus *Lepidodendron*.

They are rhomboidal in outline, pointed or truncate at the top, rounded at the base, enlarged on the obtusely pointed sides, marked in the middle by a

slightly inflated bolster, and topped by a small rhomboidal leaf scar, marked with three vascular points. The details characterizing this species, and which have not been given by the authors, are represented in our plate 22, fig. 4. The outline of the cicatrices differs indeed from that of the known species of *Lepidodendron*, and when the surface is somewhat erased, as in the part represented fig. 4*b*, and as is generally the case on specimens of this species, it is undistinguishable from that of *Sigillaria Menardi*, Brgt.

In its decorticated state the species equally preserves the appearance of a *Sigillaria*, its wrinkled surface being marked by mere semilunar, inflated dots, as seen in fig. 4. The strobile scars are proportionally large, approximated to each other, alternating in two vertical rows, nearly exactly round, or rather enlarged horizontally.

Mr. Jos. Even, of Morris, has kindly sent photographic plates of large specimens of his, which bear these strobile scars, one and a-half inches in diameter, at a horizontal distance of three inches, and only one and a-half inches from each other in vertical direction. The vertical distance of these scars is apparently variable; it is, however, generally shorter in this species than in the following ones.

On shales at Morris and Colchester.

Ulodendron ellipticum, Sternb.

Pl. xxii, fig. 3, and Pl. xxiii, fig. 1 to 3.

Under the name of *Lepidodendron ornatissimum*, Prof. Brongniart has represented in his Foss. Flor., vol. 2, pl. 18, a large specimen of this species. As there is not as yet a detailed description of it, and as the cicatrices of the surface are not as clearly defined on the European specimens as on ours, I have figured the essential parts of this species as exemplifications of its general appearance.

The surface cicatrices are almost exactly rhomboidal, angular on the sides, slightly elongated, more or less distant, with the leaf scar nearly central, marked in the middle by a depression or small hollow, as indicating the place of a single vascular scar. These scars are not indicated by any of the European authors. It is probable that the two lateral ones are obliterated, but, although a great number of specimens were carefully examined, they could not be detected on any one of them. Pl. 23, fig. 3 enlarged, shows the details of the forms of these cicatrices.

The strobile scars on this species are opposite to each other, vertically more distant than in the former, or four to six inches, and horizontally six inches.

1. Ulodendron ellipticum. I have seen at J. J. Strong one specimen of this species with bolsters distant across or horizontally twenty centimeters. The same distance is measured upon another from Pittston vertically; this last specimen is narrow and has only one row of Bolsters.

[illegible] drew Shenkum's specimen N°3800 of Lacoe. It is [illegible] and has [illegible] of scars very distinct. [illegible] rather [illegible] [illegible] [illegible]

437a.

1 Ulodendron elongatum. Fig 4 I have seen at Dr. Hirsch, Moores a very rare specimen, 30 cent. broad and 1 meter long, more or less flattened, bearing opposite round or nearly circular bolsters, eleven on each side, comparatively small at least considering the size of the specimen. The leaf scars in this and all the specimen which I have seen and have obtained are exactly alike and always separated by a double border as figured and described here. Another specimen of the same species has the bolsters 6 or 7 cent long and 5 cent broad The two specimens which I took with me have them seven to eight centimeters long and four to five cent. broad. The form of the bolsters is therefore very variable. While the character of the leaf scars are permanent. In both these specimen which apparently belong to an old and large tree their hair scars are less than one cent long and rarely half as broad in the middle. The coaly covery of the species is thick, at least one millimeter. The distance (vertical) between the bolsters in old trees is twenty one cent. with bolsters 5 to 5½ cent long and 4 cent wide

2. Ulodendron elongatum. The distance between the bolsters in this species is sometimes very great as I have seen at Hirsch specimen one foot square without any bolsters. It is always deeply irregularly ribbed, as seen Pl. XLIII f. 2. 1.

3. Ulodendron ? Fig. 2,5 Fragment of a stem surface about 10 centimeter broad covered by small ◇ scars like those of Ulodendron majus but covered with a coating of coaly matter which renders their character obsolete. The middle of this stem has an oval convex scar three and one half cent. long, a little more than two cent. broad covered with the same kind of scars though it is exactly like that of an Ulodendron. It is upon coarse conglomerat and the coaling of coal has been flattened by stepping surface the whole is not distinctly determinable,

On the largest of my specimens, the scars are two and a-half inches long and one and three-fourth inches broad. Some of these scars are distinctly marked by the cicatrices of the surface nearly to the middle, or just to the point of attachment of the strobile, which has only one-third of an inch diameter. This clearly indicates that the growth of the leaves was stopped around the pedicel of the cones by the compression of their open scales, and that the cone itself was attached to the tree by a pedicel as small as is generally the central axis of a *Lepidostrobus*.

Collected in splendid specimens from Morris, by Mr. S. S. Strong.

Ulodendron elongatum, Sp. nov.

Pl. xxiii, fig. 4.

The cicatrices of the surface are in this species about of the same form as those of *Lepidodendron rimosum*, Stern., or of *Lepidodendron simplex*, Lesqx., as represented vol. 2, pl. 45, fig. 5, ofthis Report. They differ only by a narrow, elevated round border, which, as they are slightly apart from each other, leaves between them a narrow smooth furrow. The leaf scar is nearly central, as marked on the figure, and shows the three vascular points of a *Lepidodendron*. The strobile-scars are proportionally longer and narrower, than in the former species, nearly twice as long as broad, vertically distant eight inches or more.

As I have not seen any specimens with double rows of these scars, I do not know at what distance they are placed horizontally, and whether they are alternate or opposite. From the form of its cicatrices, this species might be identical with our *Lepidodendron simplex*, and the strobile scars represent the base of a cone like *Lepidostrobus princeps*, Lesqx., loc. cit. Both species also may be referable to *Lepidodendron rimosum*, Sternb., and *Lepidostrobus variabilis*, Ll. and Hutt., which Prof. Geinitz, in his Verst., p. 35, describes as the same. It is only remarkable that this celebrated author persists in considering these enormous cones as sustained at the end of small branches which, according to his description, are only one-third of an inch in thickness, and that he admits the round scars of cones as mere branch scars. He has only figured one of them, however, in his tab. 3, fig. 16. It appears to represent the three different forms of *Ulodendron majus*, under the name of *Halonia punctata*, Ll.

Ulodendron punctatum, Sternb. Vers. 2, p. 186.

Tab. 45, fig. 1, a-e.

I refer to this species, though with some doubt, a beautiful and well preserved specimen, lately communicated by Mr. John Collet, from the Mahoning sandstone? of Clinton, Vermilion county, Ind., near the limits of the State of Illinois. The specimen represents a branch compressed into an oval shape and slightly arched, three and three-fourths inches broad across in its broadest diameter, two and a-half inches in the narrowest compressed part, its upper cortex marked by small, oval, convex-pointed intumescences, with a small oval, deeply concave scar at the point, placed in spiral at about one line distance from each other. The upper cortex is formed by a pellicle of ferruginous, semi-carbonaceous hard matter, no thicker than a quarter of a line. Under it the surface is marked with the same kind of cicatrices, but the top oval scars are obliterated. On both sides of the branches there are two longitudinal rows of strobile scars, one and a-half inches distant from each other, a little less than one inch broad, oval in outline, the center marked by a round cavity, from the bottom of which a small mammilla protrudes. This is surmounted by an elevated margin surrounded with round cicatrices like those of the bark. These branch or strobile scars are alternate, five on one side, three on the other, horizontally three inches distant in measuring across the upper broadest part of the branch, and six inches in measuring on the other side across the more flattened part, therefore appearing as placed in two rows on both sides and towards the superior part of the branches. The same configuration is remarked in Sternberg's figure; but here the scars are placed along the concave border of the curved branch, while in ours it is along its convex portion. The name of *punctatum* is given to the species from the points upon the branch scars, in the author's figure, the cortex being marked by broadly triangular cicatrices. A few only of the same form are perceptible at a single, small, decorticated spot near the most erased part of our specimen, under a double layer of upper cortex. It appears, therefore, that this specimen represents the same species in a better state of preservation. *Bothrodendron punctatum*, Ll. and Hutt., 2, p. 86, has the same cortical cicatrices as ours, but differs by its long and more distant strobile scars.

Morris, on shales.

1 Bothrodendron (Rhodendron) punctatum The description there is good
I have a copy of a specimen in my [redacted] collection drawn, bark in the scar
14 cent long 2 10 cent broad. I think it comes from the Collection of
Marietta College. Schimper considers this species same as L. Sandleyana
There is another sketch of the same species in the same book. from Mr
Dille of Newark O.

238 1. Lepidophloios species. Butts N° 142 is a species of this genus very much like my L. obcordatus of the Ill. Report vol II p. 457. The specimen is however somewhat crushed and the scales rendered undistinct.

[illegible] apical scar under the leaf [illegible] Butts N° 143. has the scar somewhat narrower [illegible] with the circular L. latus. The form has also the form specific of the same as N° 609

1 Lepidophloios laricinus, Hemt. Spec. from Pennsylvania upon Pennsylvania Coal Ms 79 very fine - a flexuous or tortuous branch or stem, 12 cent. long, 2 cent. three millimeters broad, dichotomous marked with round deep scars of branches 1 cent. in diameter, two & three cent. distant covered with very deeply marked bolsters of bases transversely rhomboidal inflated in the back with a bifurcate bolster at the base. At least this is so, in considering the direction of this branch as it is done in Goldenberg, the bolsters being turned backwards. From the dichotomous branch at the base of our specimen, this can be understood only in admitting there a root of Lepidodendron or perhaps Halonia? to which this is like by the scars of branches & still more of a Ulodendron the leaf scars resembling those of Ulodendron minus. (Sp. Pal. reget. Pl LXIV, fig. 1. In contrast, it seems, the short dichotomous branch appears flattened and dichotomously subdivided in four branches, small somewhat narrow flat, with obscure scar bases, and below the branches, the mamelles and the decurrent point are evidently carried without the elevated bolsters mentioned above them in Goldenberg figure which is copied by Schimper Pl. 64 fig 4. There is in the specimens of Mansfield one representing evidently Lepidophyllum majus as figured by Schimper and by Goldenberg, pl. 16 fig. 11. There a good figure of this and of the different forms of the bolsters. If course if these stems are roots the Lepidophyllum is not referable to this. The round scars resembling those of true cauls not of branches the bolsters are marked to near the bottom where has a small round cavity 3/4 millim. broad showing point of attachement of the rachis.

2. Lomatophloios Crassicaule? Corda. Pl. 16 fig. 2. a specimen from Morris Shale is represented by a cylindrical external cylinder flattened representing a branch 2 to 2 1/2 cent. thick, marked with obscure scars placed in spiral, more principles and distinctly visible at the base at the top, nine centimeters distant, the spiral direction of the cylinder covered by a shaly crust 1/2 millim thick whose surface bears impressions of erect obovate, truncate scales barely imbricated at their base, twelve millim. long & nine broad, grooved in the middle, truncate-end at the top. These impressions are just like those figured in Corda Beytraege Pl. 1 figs 1, 2, 9. except that the upper rhomboidal scar is cut out & the lower part merely preserved. The depression in the middle of the scale is narrow and descends to near the base. I refer this specimen to the species with no doubt but it represents Lomatophloios very much like that of Corda. The same shale have Lepidophyllum cuneiculatum the impression which may be referable to this as L. laticeps fig 11 Pl XVI of Goldenberg is referable to Lomatophloios crassicaule? or Lepidodendron laricinum?

3. Lepidophloios or Lomatophloios apparently new. Pl 2. Scars small oboval, acute at the top acuminated at base. Cicatricule at the top enlarged obtuse at the lower part pointed above appendage large caudo none. With these there is a fragment of Cone Lepidostrobus. It is like L. obovatum but has not any caudo and the cicatricule is placed higher and broader. It is Lepidodendron depressum Lyppt Devon. p 174 Pl XLIII fig 5. Differing however by the cicatricule rupunctate not subpunctate by the total absence of caudo which in Goppert species marked by three or four cross wrinkles. See it figured L-539, 5 & the specimen Pl 2 has a caudo

1. Lepidophloios. Of this genus the museum has specimens of the three species mentionned in the vol. Nothing to remark.

D 2. Lepidophloios proteberans Lyo. Remark on the species that the protuberance upon the corticated specimens is rarely marked. It was so in the first we saw in vol. But in others there is rarely any trace of it. From specimen N. 130 which represents Lepidodendron manillatum Lyo it would seem that this species is a decorticated form of L. protuberans. The specimen however is varnished and the evidence is not at all positive.

J 3 Lomatophloios crassicaule Corda t. 71. is the internal path of this species as figured by Goldenberg in Fl. Sarapontana, Pl 14 fig. 4 & 10. I take specimens to represent the same species though larger. His 6 to 9 fig 9 bis at.

Lepidophloios is next separated from Sigillaria by the form of the cicatrices which are narrow, very extended vertically in the axis of L. laricinum Sterz. and also to Lomatophloios macrolepidotum as figured by Gold: tab 14. fig. 2. But from this it differs by the much smaller size of its cicatrices and from both by the larger size proportionally at least of the leaf scars. Fig. 10 a [p. 529] represents the natural size, 10 b the enlarged cicatrice, 10 c the corticated scars of the same species. It is somewhat doubtful how far apart Sternberg. His much like Tab. 14, fig. 14 in Gold. of Lomatophloios crassicaule and should be referred to this species. See p. 439 c (2)

D 5. Lomatophloios Mansfeldi. In Mansfield's specimen I found N. 18 - 20 large Lepidophyllum with linear lanceolat acuminat blade much like those of Lepidophyllum majus but longer rather more like Lomatophloios intermedium in Gold. Pl. 15 fig 5 differing however by more linear longer blades and by terminal sporange. The blade being undulate crosswise nearth lower part. One is 10 cent. long with the blade apparently narrow linear with three inward veins in the middle. The other of the same length is oblong, lanceolat acuminat, slightly narrowed at the sporange same size and form as Lepidophyllum majus Brot as fig. by Geinitz Pl. III. 5 except that in their specimen the sporange is more pointed evidently representing a sporange. — With this there is a specimen Ma 21. which should be figured whole. It is a piece of bark, representing bolster with the middle scar broadly rhomboidal distant, surrounded by smoth depression, elongated downward like the tail of a Lepidodendron bolster. also resembling those of Lomatophloios in Gold. Pl. XV f. 9. but much more distant. The same specimen has a leaf linear with broad inflated midrib which is distinctly lineate and borders nearly smith the whole leaf about 8 millim broad. What much resembles fig. 8. of Pl XV of Gold. and three other specimens represent long pieces of thick stout stems flattened but covered with a thick coal of wood about 1 mill thick which appear like fig 15 of the same plate. All these specimens have to be figured and compared for description referring them to a Lomatophloios. but evidently a new species. — Lepidodendron Mansfeldi is a Lomatophloios.

Genus LEPIDOPHLOIOS, Sternb.

Ill. Geol. Rep., vol. ii, p. 457.

Lepidophloios? auriculatum, Sp. nov.

Pl. xxx, fig 1.

Stem or cone covered with large thick rhomboidal imbricated scales, broader than long, rounded at the sides, marked at the top by enlarged rhomboidal cicatrices and three obscure vascular points.

The specimen copied in our figure looks like a part of a large flattened cone, whose broad thick rhomboidal scales are imbricated like those of a strobile of pine, and in the same order. According to Prof. Goldenberg, specimens of this kind should merely represont the surface part of stems (*Lepidophloios*), whose leaves are attached at the base of the scales which cover them. If this is the case, it is doubtful, indeed, whether our plant is referable to this genus, notwithstanding the similarity of the scales to those of some species of European *Lepidophloios*, or whether it should be considered as a cone or *Lepidostrobus*. It is evident that the scales, which are often found isolated and variously grouped on the shales, were free to their base; that in their union, as in the specimen which is figured here, they rather represent the form of a strobile than that of a stem, and that also some of these scales appear connected with *Lepidophyllum auriculatum*, Lesqx., though the mode of connection is not distinct. On the other side these scales are marked at the top by three vascular points like the scales of *Lepidophloios*, and also have in the middle the small scar scarcely perceptible with the naked eye, which Mr. Goldenberg considers as the scar of a spine, and which also is a character of the genus. They are, moreover, remarkably similar in form to those of *Lepidophloios laricinus*, Sternb., as figured by Goldenberg in his Flor. Sarr., pl. 16, fig. 1. Though this may be its true generic relation, this species differs from the European one by the scales, which in ours are proportionally broader and shorter, and by the small medial scar which is triangular and not round.

Found in the shales of the coal of St. Johns.

Lepidophloios laricinus, Sternb.

Vers. 1, p. 23, Pl. 11, fig. 2, 3, 4.

It is not rare in the shales of the coal at Morris, in good, well characterized specimens.

Lepidophloios protuberans, Sp. nov.

Pl. xxvi, fig. 1 and 2.

Stem arborescent with cicatrices somewhat distant, separated by thin, undulating, continuous wrinkles bordering the cauda; cicatrices double; the upper part or leaf scar is rounded upwards and downwards, obtusely acute on both enlarged sides, marked by three vascular points, the middle of which is capped by a small, half round dot; the lower part like a broadly oval-rhomboidal wing, has both sides curving downwards as a prolongation of the borders of the leaf scar, and abruptly bent into a long pointed cauda, fig. 2. The wing is marked above the middle and under the leaf scar by a semi-lunar upraised scar. The cicatrices are generally deeply immersed in the stone, and their outlines rarely discernible. They are often covered with a coat of thick carbonaceous matter, and their center marked by a prominent nose-like gibbosity.

In the shales at Morris; collected by Mr. S. S. Strong.

Genus LEPIDOSTROBUS, Brgt.

Ills. Geol. Rep., vol. ii, p. 455.

Lepidostrobus (species).

Pl. xxx, fig. 4 to 7.

The figures represent in detail a specimen of a cone of *Lepidodendron* in concretions, which has its sporanges and spores still preserved in their primitive position. The form of the

Lepidostrobus & Lepidophyllum.

D.1 Lepidostrobus variabilis H. & Hull, as figured and described in the preceding Vol. Pl. 24.61. We have a large number of specimens referable to this species. In stroke are closely appressed in cylindrical &c: all the characters indicated by the author. A small broken specimen only, Ls 26 show the horizontal direction of the sporanges; all the other specimens inflattened showing only the form of the imbricait blades.

H2. Lepidostrobus mews propria? Specimen Ls 8 from Mines town and in the same rock as the former species is abundant appears to have the stroke more linear and not lanceolat in form of the cone and its size too is the same. This may be due to the compression of upper stem leaves covering the cone. The specimen is therefore undetermined.

T 3 Lepidostrobus princeps Lqx. This species of which we have superb specimens in the museum, especially the cross section, fig 3 of Pl. 13 this rep. vol 2. is scarcely different from L. Geinitzii Schp. (L. variabilis Geinitz). It appears however to differ by shorter cone and proportionally shorter and broader blades. On the back of specimen Ls 24 there are however leaves, Lepidophyllum, appearing nearly as large as L. majus or L. auriculatum. On the back of the same specimen has also a branch of Lepidodendron Sternbergii. Brt.

T 4 Lepidostrobus Goldenbergii Schp. Two specimens from Mazon creek Ls 36 & Ls 37 referable to this species. From these specimens and by cutting them the form, form &c of the sporanges and nature of the scales will be easily ascertained. These specimens by form of cone resemble L. ovatus Lqx. and by the description and figures of Schimper Vol. Pal. 2 p. 61 Pl. 61 Fig 3 & 4.

T 5 Lepidostrobus ovatus Lqx. Only a small broken specimen from Mazon creek, referable to this species as in Bronniart figure n. 2.

L 6 Lepidostrobus linearifolius? sp. nov. Cone cylindrical, 2 centim. wide about 6 centim. wide long, with blades erect, appressed, long, 3 to 4 cent. narrow, 2 millim. wide, linear, marked in the middle by a broad double nerve as in Lepidophyllum. The specimen is broken and nothing more can be seen. It may be the same species as the one figured in this vol. pl 30 fig 4. The name anyhow is not good as I have already Lepidophyllum linearifolium which is quite different.

T 7 Lepidostrobus ovatifolius Lqx. This vol p. 441 Pl 30 fig 2 & 2b. As seen from numerous specimen the separate base is the same. In a good specimen Ls 28, the width of the cone is 13 mill. length of the sporanges 4½ mill. the axis is 3 mill. wide. This species has the blades of the same form as the following, only shorter and more lanceolately pointed. It may be a mere variety. The figure shows it more rounded at the corners than it is generally. It may be a variety of the following. — From re-examination it appears that these species are indeed different, the basilar corner of the first, L. ovatifolius being less extended outside and often shorter, not quite as much as in the figure. The blades are shorter more lanceolately pointed. See figures corrected Pl 30 2b & 3b. See p. 442? (1)

L 8. Lepidophyllum lanceolatum Brt. not much difference from L. oblongifolium. The blade is narrower proportionally longer, linear lanceolate with a broader shorter sporange. All the specimens representing this species are from Pottsville or rather Lagonier near Pottsville, a low coal Mammoth or 5 foot vein. One specimen Ls 16 from New port which at first I considered as a new species on account of its broad sporange appears to be either this species or rather L. oblongifolium with sporange deformed by compression like the other specimens of New port. It is in same drawer with this L. lanceolatum.

L 9 Lepidophyllum lanceolatum? sp. Ill. Rep. p. 442 Pl 31 fig 7 & 7b. One specimen only Ls 38 from Mazon. The blades are more long pointed or more tapering, but for this there is no difference.

(1) See Lepidostrobus lanceolatus p. 442 & 4

L440c

10 Lepidostrobus ? rec: progyus ? ingd. Represented by a large number of specimens all from Morris. Its form is that of L. lanceolatus, but with the blade proportionally broader, being shorter while its sporange is twice as long and abruptly narrowed at the base of the blade and linear lanceolate. I supposed at first that the sporange of the former species Lep oblongifolius, lanceolatus &c might have been broken - but it is not so. In this species the sporange is often broken always at the point of attachement with the blades; where it is preserved it is always the same size as long and half as broad as in the related species. Specimens Ll 26 to Ll 29. Ll 26 from the breath of the sporange to the 14 veins intervals to this same species. Ll 14 is the only module representing a cross section of Lep dostrobus not broken or poorly preserved blades.

D 11 L49. Lepidostrobus brevifolium & L. hastatum Lesq. Penn^a report, pl 17 fig 6 & 7 are good distinct views, the first is from Wilkesbarre the second from Johnstown. Some of the blades in these last specimens have a few shorter coriaceous blades but they preserve their form, enlarging gradually from near the base while the other enlarges by an arched border near the point. The figure of both species is right, only that of L. brevifolium is generally sharp pointed. See corrected figure 6. The trouble of both these species appear to have been composed of both sporangia bearing scales and of leaves mixed with them. The leaves in marginata being longer 2 inches about. Even as narrow as those of brevifolium shorter do not run in the falcate, ovate - It is impossible to see the relation of the leaves upon our specimens. There leaves may be a kind of bracts at the base of the strobile. Ll 1b upon same specimen as Ll 1. Lepidostrobus brevifolium, has a Lepidostrobus apparently L. lanceolatus Rept. see 440c 20. L 443c-1.

D 2 Lepidostrobus species progyus ? Specimen Ll 43. A fine large strobile 11 centim long, 4½ cent wide without the blades, oval cylindrical a somewhat narrowed for the base upward, axis about 9 millim wid. Sporange somewhat oblique & nearly at a right angle to the axis, long 16 millim: blades slightly open curving upwards not apparently lanceolate, tapering from an enlarged base into a long narrow point. These leaves are mostly imbedded in the stone and their form is not distinct. They are a little more than 2 cent long. The form of the blades as described is seen merely from the top of the strobile. They are much like those of Lepidostrobus princeps in Ill. Rep. 2 Pl. g. fig 2. & fig 4. but the form of the strobile which is much shorter and rather ovate is different.

D 14 215 Lepidostrobus majus & L. auriculatum. Two distinct species differing not only by the auriculate base of the blade, but still more so by the more linear (not enlarged at the middle) longer tapering blade generally with a longer sharper point sometimes falcate or turned to one side. Both have apparently the same form of the sporangy which however is shorter in L. auriculatum. and both have blades somewhat longer & shorter indicating that L. & L. species Lepidophyllum intermedium is a mere variety of L. majus as my L. acuminatum Penn^a Rep^t is a var of L. auriculatum dug. by L. Lesq. in a sum of this vol. p 443 Pl. 31 Fig 8, I have a splendid specimen Ll 8^b which seem to prove that the narrowing at the base of the blades is due merely to a flexure of the borders and not to a peculiar kind of organization and that therefore this species is a form of L. majus. see p 443 b

16 Lepidostrobus linear ? sp nov ined. Spec Ll 13. Blades long narrow 2 millim wide, linear, taper-pointed, slightly enlarged above the collum where it rounded to a narrow lanceolate pointed sporangium 12 millim long. The blade from the collum to the point is 7½ cent long. This species much resembles what Schimper has figured and described in Pal. Veg. Vol. 2 p. 71. Pl 61 fig 4 & 4a as Lepidostrobus Bornianus except that the sporange is more narrow & is naked or without seeds. Specimen 85d of Lacoe has the blade with the sporange. The sporange is nearly equilateral 1½ cent long, 8 millim broad, the base of the blade or support enlarging above the axis of the seeds. see fig. 10 p 533. Glumes are not covered. Of the specimen 85b it represents the base of the leaves with the blades of the same with that because the bearing scales and

Pl. 1. Lepidophyllum species? two specimens may be referable to this genus. Pl 41 representing a long linear narrow channeled leaf enlarged at base without sporange
Pl. 1a may be a leaf of Lepidodendron. and Pl 11 a linear very tapering lanceolate tapering
shaped leaf about 3 cent long abruptly enlarging into a "homologital arrange?" is
it seen is not discernable. At the point where it is the broadest and most is the sporange
the ear is 4 mill wide, near to point it is scarcely one millim.

Pl. 18 Lepidostrobus truncatus Lsqx. This vol. p 442 & pl 31, Fig 5. From the form of
the small ear with the same form and size form of appressed scales, I consider this
specimen as representing the species. The appressed blades are lanceolate pointed.

V. 1. Lepidophyllum?? Pl 111. A narrowly oval body about 4 centim. long ovoid at
its base with broadest part, obtuse, narrowed downward to a kind of petiole, smooth
or without trace of nerve. It may be a kind of fructification like "in other
words" see figures 4 p. 62 Z. incertus p 443 & 77

Pl. 20 Lepidostrobus brevifolius? see Z. or Lp. proprius I had at first considered a few
blades of this species Pl 26 & 27 as part of a theca of Lyginodendron. But speci-
men Pl 60 show these to be imbricated around a common axis and to be mere blades
of long oblique sporanges immersed in the stone. The form of the blade is intermediate
between that of Lepidophyllum brevifolium & Lepidophyllum hastatum. Broader
and shorter than this last species but exactly lanceolate pointed. It may be a new
species; but the specimens are not good enough for satisfactory determination.

Pl. 21 Lepidophyllum foliaceum Lsqx this vol. p 444, pl. 31 fig 10. I can say nothing
more than I have published on this species though the museum has now a
specimen with 2 leaves which are flattened around a common point or an
axis. It is impossible to see if these leaves bear sporange immersed in
the stem at their base. See Pl 36. See p 444 a. (1)

Pl. 11 Lepidostrobus? fig 5. Le peculiar branch of imbricated round irregular
scales which has no analogy to anything known to me may be annulate??

Pl. 18a Lepidostrobus truncatus Lsqx. I refer to this species with doubt a small
Lepidostrobus Pl 44 whose blades are considered and which has merely relation to this
species by its form and its size. It may be something different, perhaps not
even a Lepidostrobus. But the specimen is too obscure to positively say
what it may represent. It is the same with the specimen Pl 45 which appears
the same kind of organism, an obscure somewhat hairy gemmiferous and inflated mass
same form and size as fig. 5 of Pl 31. and it is covered with longer blades linear or lanceolate.

Pl 23. Lepidostrobus omnivens Lsqx. This specimen Pl 46 is exactly like
fig. 6. pl 31 of this vol. only three times large. It represent an oblong somewhat
conical ear born upon a narrow pedunculate 1 to 2 millim wide. 4 centim
long from the base of the sporange, to 18 millim wide near its summit
with near the top which is more truncate, notched in the
length by five to 7 parallel narrow sinus which come very near the summit.
the sporanges are near the base are nearly perpendicular to the axis, to the axis,
the blades upraised and appressed against the cone appear long and linear
The cones do not represent the blades as I supposed it in describing the small
specimen figured to it. though well marked, the blades do not appear as
marked as on them. His circumstances is the same that as with the blades
described Pl 10 & 11. But they do not appear to belong to it. It is therefore
known merely from its peculiar form and as distinctly described as can
be from its appearance.

24 Lepidostrobus ?? Specimen 2 is represent a branch 6 millim wid obscurely marked by cicatrices rather pointed at bot, and placed in spiral as in Lepidodendron. bearing thick, short, lanceolate pointed leaves arched upward and joining in a point at the top. It may be referred to Lepidodendron dicholomum Hemb. or rather to L. selaginoides as figured by Hemberg I Pl. 16 fig 3. I put it with this species in drawer. Specimen 25 7. is also a branch which may belong to Lepidodendron it is a top of left of appressed linear leaves at the top of a curved branch. The form of the leaves or blades as also the scars of the branch are totally obsolete. In drawer of Lepidostrobus ?

25 Lepidostrobus ? spec. nov. Ma. 23. cone long 18 centimeters, base and top destroyed, linear, comparatively narrow, nearly three centimeters broad without the blades, which are open but half erect and seventeen to eighteen millimeters long distantly sharply narrowly lanceolate-acuminate from an enlarged base. The cone is flattened at surface covered with decaying coat half a millim. thick marked in the decorticated part with very small triangular scars in spiral. Compare to this Macrostachya infundibuliformis in Schp. Atlas. pl. XXIII, fig. 12. and also Lepidostrobus Variabilis Geinitz Pl. II fig. 1. But in our species the axis is broad, there is no place for the horizontal position of the sporanges it can not be a Lepidostrobus but more probably a Macrostachys. but this has nothing to do with fructification of Calamites or of Calamostachys infundibuliformis, the scars being in spiral, while in all the Calamostachys the rings are in cons. This might be a large stem of Lepidodendron like those figured in Brongniart. differing however by the very small scars. (This is a true Lepidostrobus. The axis is covered, this not large.). — I find the same Cone in the museum of New-Brunswick under N. 38 and named by one upon the label L. Hunzeri. See p 442 No. 1.

26 Lepidostrobus ornatus Dawson. Transversal section Ma. 85 This section is two cent. broad, the axis 4 millim. The flattened sporanges distance at with the blades short and oblong like those of the cone figured in Hooker Geol. Surv. pl. X fig. 1. & 7. Small round microspores appear through the tissue or parietes of the sporange

27 Lepidostrobus ? cross section Ma. 89. The cross section of a lepidostrobus ? It is very obscure and similar to a whorl of Annularia sphenophylloides of large size. The relation to Lepidostrobus is indicated by a number of macrospores of Lepidostrobus scattered upon the shale, nearly half a millim. in diameter by one when seen from their point, rounded upon the other end. This cross section is about of the same size and the rays a sporanges of the same form as in the former species which however has apparently microspores, so far as can be seen through the walls of the sporanges. May be the same species.

28 Lepidostrobus ? analogus. Sp. nov. (don't know the exact name) N. 524 Large specimens Cone 25 cent long narrow, two cent broad. scales closely imbricate, linear acute or lanceolate of rhombic form. axis nearly 1 cent broad. The cone is inflated like a ballon like the top

blades and of the sporange-pedicels, as they appear when isolated from the cone, is not recognizable, therefore its specific relation is uncertain.

The cone is figured as an illustration of the position of the sporange-cells on their axis, to which they are perpendicular, and also of the form of the seeds. These seeds, fig. 6 and 7, highly magnified, resembling those of a *Lycopodium*, are exactly three one-hundredths of a millimeter in size, nearly round or slightly tetrahedral, with valves discernible but without borders, and often agglomerated by triplication, but separating easily. The absence of borders or wings on these seeds indicates their maturity. They are easily detached from the sporanges, like a brownish powder. The part seen at the top of the cone, and represented enlarged in fig. 5, seems to be the support or the pedicel of a blade or the scale of the sporange.

In a concretion from Mazon creek.

LEPIDOSTROBUS OVATIFOLIUS, Sp. nov.

Pl. xxx, fig 2 and 2*b*.

CONE about three inches long, one inch broad, with short, erect blades; blade obtuse at its base, lanceolate obtusely pointed, comparatively broad; pedicel of the sporanges short, lanceolate. The axis of the cone appears to be narrow, a peculiarity which does not agree with the shortness of the pedicel of the sporange. As the detached blade, fig. 2 *b*, is copied from another specimen which is crushed, and whose form is unrecognizable, it may belong to a different species.

In concretions from Mazon creek.

LEPIDOSTROBUS OBLONGIFOLIUS, Sp. nov.

Pl. xxx, fig. 3 and 3*b*.

A VERY fine specimen, also from the concretions of Mazon creek, representing an exact cross section of a cone. The central axis is one line broad, the blade one inch long, its breadth one-third of the length, oblong, obtusely pointed,

squarely cut at the base, and without auricles; pedicel of the sporange narrow, lanceolate pointed, one-fourth of an inch long. In its length it corresponds exactly to the distance between the border of the axis and that of the line of circumference of the cone. The sporanges are obscurely marked on the stone, mixed with pyrites, but I could not detect any spores.

Lepidostrobus lancifolius, Sp. nov.

Pl. xxxi, fig. 7.

A small, apparently narrow cone. The pedicel of the sporanges, fig. 7 *b*, is very short, broadly wedge-shaped, obtusely truncate at its base; blade one inch long, slightly enlarged in the middle, tapering into an acute point, with slightly diverging acute auricle at the base; medial nerve sharply marked.

On a concretion from Mazon creek.

Lepidostrobus truncatus, Sp. nov.

Pl. xxxi, fig. 5.

Cone less than one inch long, round ovate, obtuse, truncate at the base, with densely imbricated, short, lanceolate *sphorophyllæ* (blades). None of these can be distinctly seen, being compressed against the cone.

In a concretion from Mazon creek.

Lepidostrobus connivens, Sp. nov.

Pl. xxxi, fig. 6.

Cone small, ovate obtuse, of the same size as the former, with long, narrow, linear lanceolate *sporophyllæ;* blade as long as the cone, curved at its top and covering it.

Lepidostrobus oxylepis &c. I have seen at Morris from Mazon creek some cones preserved entire in nodules and which seem to represent this species, though this may be a new one (see specimen 4216 12). The cone is 13 cent long, 22 mill broad without the blades which are imbricated but open, averaging one centimeter long and 7 to 8 millim broad at the base. The form is that of Pl. XXX fig 26 of this vol. the blades being only apparently a little more acuminate. The axis appear very narrow and there the sporanges measure also one centimeter in length. The whol Cone being cut vertically through the middle the trace of spores or small rounded cavities are seen, irregularly placed and few. Their reference to spores is uncertain. Compare Lepidostrobus insignis (L&H 40a, 25,) - I have compared it. This cone of Mazon creek is shorter by at least one half, narrower with shorter broader triangular obtuse pointed blades, very different indeed. See pl. 446 (X).

Lepidostrobus hastifolius? Lesq. Specimen of Lacoe 216 & 221, represent a small cone four centimeters long, seventeen millim broad above it, long linear tapering very gradually narrowed upward to near the top where it is but one centimeter broad. Sporanges apparently short oblong lanceolat acuminate erect, closely appressed to the cone and imbricated apparently enlarged at the base and lanceolat blades turned upwards closely imbricated apparently enlarged at the base and lanceolat readily nerved in the middle. The form of the blades is not distinct. The answer however that is given in pg 7. Pl. 17 Penn: Depart but the enlarged base of the wings can not be seen distinctly, may be referable to L. variabilis. L&H. which refers to different species.

Lepidostrobus variabilis, L&H. A very fine and entire specimen of Lacoe N°. 3015 may perhaps represent this species. The cone is linear oblong gradually tapering upwards to a point or exactly lanceolat 13 cent. long 2½ cent broad from above the middle to the rounded base. Sporanges narrow exactly horizontal or in right angle to the axis, blade narrow lanceolat acuminat erect, closely appressed to the cone and imbricated, about eight millim long and one millim broad toward the base, undistinct. This answer to the description of Schimper and his figures copied from those of Lindley except for the point, which in those authors is obtuse while in this species it is exactly lanceolat or long tapering pointed. See p. 4427

Lepidostrobus lanceolatus Bgt. Lacoe specimen 334 b has a fragment of a cone of this species. Cone exactly linear and narrow, apparently very long; the fragment preserved measures 9½ centimeters long; its width without the blades 1½ centimeter, the axis four millimeters and the sporanges on both side only 5 millimeters or a little more. The blades are half open, divergeing 40 to 45° from the axis. As seen on a separate Lepidophyllum upon the same specimen and which is one of the largest which I have seen of this species (see figure) and also the best preserved, the sporange is 8 millim long cuneiform obtusely pointed at the base, truncate undulate under the base of the blade, inflated with a deep line in the middle and two more obscure on the sides. (see figure). The blade is 33 millim long linear oblong lanceolat acute 7 millimeters broad in the middle and at the base which is enlarged hastat on both side in joining the sporange. This last character is not seen upon all the specimens for most of the time the base of the blade seem to cover just the top of the sporange. As seen upon the cone, the blades appear shorter but equally large; they measure in length only from 5 to 8 millimeters. The fragment of Cone should be figured

4112 X.

D (1) Lepidostrobus (Goldenburgia) sp. ex 4111 X 25 There is at M. Mansfield an entire cone of this, of which I have an specimen partly broken. The entire cone measure 33 centimeters long and is obtusely pointed at top. The base is seen on my specimen.

Dl2 Lepidostrobus cylindraceus, by now, cones nearly exactly cylindrical, 7 millimeters broad at the base, five at the top, 7½ centimeters long, central axis narrow, two millimeters in diameter, bracts very short subspinous, linear lanceolate appressed to the cone axis imbricated. Dr Britton.

D

D

D

Aldrich

1. Lepidostrobus brevifolius L.H. a Specimen from Aldrich upon yellow clay, and without locality has upon one of the pieces a cone cylindrical 35 millim. long, 10 millim. broad, bladed closely imbricated, 4 millim. long, acuminate, enlarged at the base where they measure 2½ millim. broad, marked upon the back by a strong broad nerve the very base of the blade can not be seen on account of the imbrication. This may be comparable to the small cones I have from Alabama. These are not distinct at least not the form of the blades. The size and form of the cone is the same, the bases [illegible] at the base over lying one another, terminate with a long narrow acuminate generally curved inward.

2. Lepidostrobus incertus Dig. W 4 X 1 X f. 25 A long cone Ma. 516 a 9 cent long, but base has not been found. The scales orbicular or square, irregularly imbricated, open or turned down. The scales generally deciduous by compression. The axis is large marked by narrow oval impressions of points of attachment in spiral. Same as the specimen named Lepidostrobus brevifolius p. 440d 20. The axis varies from 2 to 6 millim. broad.

1. Lepidophyllum auriculatum, Lyg. Lx. 1611 & 1609 from Morris show the difference of this species with L. majus, not only by the smaller size and auriculate base of the blade, but by the ~~convex~~ surface, ~~as~~ thinly lineate indeed; but the line distinctly seen with the glass when the epidermis is destroyed. The sporanges are also comparatively to size somewhat longer. The auricles are scarcely marked this may be a new species. Compare it. I think it however the same.

D2. Lepidophyllum Morrisianum (see M.) Lx. 1610 a fine specimen. Blade exactly lanceolate gradually tapering to a long acumen, rounded and narrowed to the point of attachement of the sporange which is comparatively long and narrow. Black 4½ cent. long, 11 millim broad a little above the base where it is rounded and contracted to an sporange 12 millim long.

D3 Lepidophyllum majus, as represented in specimen seen at M. Thury Moores, many of them, has blades 9 cent. long and 18 millim broad with sharply acuminate point.

D4. Lepidophyllum Lacuei ~~species nova~~. Lacue spec. N. 4014 The blade is linear slightly enlarged above the middle where it is 12 mill broad and ten only near the base, ~~9 centimeters long~~ narrowed upward to a long acumen with borders perfectly entire, not undulate with a broad midrib, ~~nearly three~~ millim. wide. Surface minutely rugulose when seen with the glass. The sporange is covered. It is far different from the following and also from L. majus. see 4a

D5 Lepidophyllum ~~undulatum~~ Lacuei specimen Ma. 120. Blade eight cent long oblong, enlarged in the middle where it is 19 mill broad while it is only 11 just above the slightly auricled base rounded and repeatedly acuminate with a three costate midrib only 2 millim broad and the surface smoth All the specimens which I have seen and they are many have the blade deeply undentately folded across above the sporange. Which is seventeen millimeters long triangular narrowed downward to a point as long than broad.

D6d. N. 199 of Lacue has three specimen referable to the same species. That is three blades exactly of the same form, long-sharply acuminate of the same width, only a little shorter 7 centimeters long. All have the sporange broken off or immersed into the stone so that the blades only are known. They may be a var. minor of L. majus. and may be figured.

D6. Lepidophyllum striatum Lx. ~~like~~ the Report. I refer to this specimens Lacue N. 199 at least it seems to be the same. It is described above as L. Lacuei and figured. V XXVII bb. fig. 14.

D7 Lepidophyllum acuminatum. In the specimens of Gibson N. 3 I find a fine specimen referable to this species. This narrower than the one figured in the Report the blade 6 cent long with a long slightly scythe shaped acuminate point. 1 cent. broad in the middle and at the base with the sporange gradually rounded ½ cent. long. Nerva as same as in the one figured in plate. Just like my fig. 13.

D. ~~Lepidophyllum~~ Lacuei spec. Lacue Lacue 6 & 7 Lacue. Three lepidophylla ~~specimens~~ ~~Lacuei~~ ~~spec.~~ with blade and sporange 2 cent. long. Side ~~lines~~ lines smooth. Surface convex ⟷ cut section ~~of~~ the blade. Upper part long oblong narrowed to the ~~sporange~~ sporange triangular ~~borders~~ borders slightly rounded to the pointed base.

Lepidophyllum ~~acuminatum~~ acuminatum Lx. 1611 & 1609 from Morris. Fig. 7 n. 5-16 has the blade ~~from~~ as also the sporange not seen upon this specimen I don't think it is not to where it has been seen with blades about as long as L. ~~acuminatum~~ auct. round top as in the fig. 7.

[illegible] specimen. The base is rounded 9 cent long. [illegible]

In this species, also, the pedicel of the sporanges is unknown. Both these small cones resemble in size and somewhat in form *Lepidostrobus gemmiformis*, Gopp., Permian flora, p. 142, pl. xix, fig. 14, 15, 16; but are evidently distinct species.

From Mazon creek, in concretions.

Lepidostrobus ornatus, Brgt.

Ll. and Hutt, Foss. Fl. 3, Pl. 26.

A broken specimen of a cone of this species has been discovered by Mr. Jos. Even, in a nodule from Mazon creek. It is cut across near its base, and the form and position of the sporanges and of the pedicels are distinctly observable.

Genus LEPIDOPHYLLUM, Brgt.

Ill. Geol. Rept., vol. ii, p. 456.

Lepidophyllum rostellatum, Sp. nov.

Pl. xxxi, fig 8.

A large blade, broken in the middle, four-fifths of an inch broad, with a triple medial nerve, round, attenuated at the base or strangled at its point of union to the pedicel; pedicel of the sporanges half an inch long, rounded at its enlarged sides, and narrowed to an acute, slightly curved point. The collum between the blade and the pedicel is long and narrow, giving to this species a peculiar appearance.

Mazon creek; in concretions.

Lepidophyllum striatum, Sp. nov.

Pl. xxxi, fig. 9.

The specimen shows two blades and curved pedicels of sporanges. The blades, broken at the point and along the borders, are about half an inch broad, two inches and a half long, lanceolate, slightly enlarged above the middle, marked with

one narrow medial nerve, and striated in the length with well marked parallel regular lines, nearly as strong as the medial nerve. The pedicels of the sporanges are still curved as in their normal position on the strobile, and appear linear.

This species is distinct from every other kind published, by its striated blade.

Also from Mazon creek; in concretions of clay iron ore.

Lepidophyllum foliaceum, Sp. nov.

Pl. xxxi, fig. 10.

This leaf or blade has a form totally at variance with any other seen in the Coal Measures, and it is doubtful whether it represents a kind of vegetable organ, like those described under this generic name. It is marked in the middle by an inflated body (medial nerve?) one-tenth of an inch broad, which, at its base, is abruptly curved on one side like a sporange pedicel of *Lepidophyllum* at its point of union with the blade. This medial nerve,? slightly enlarging upwards, abruptly terminates at some distance under the obtuse point of the blade. The whole leaf is a little more than one inch long, half an inch broad, oblong-ovate in outline, cut or truncate at the base, with a small round lobe on one side of it, and split at the top in two or three deep, narrow, obtuse lobes Its surface is smooth, covered all over by a pellicle of coaly matter; the medial broad nerve only is naked and obscurely striate in its length.

On a piece of shale from the main coal of Murphysborough.

I have lately received from Mr. S. S. Strong, and from the shales of Morris, another specimen of this species, representing an agglomeration of three leaves of the same kind and form as the one above described. The point and mode of connection of these leaves is not distinguishable, though they appear to be imbricated around a common axis.

1. Lepidophyllum foliaceum Lyg. I have obtained of this specie a specimen
No 1613 given me by M. & S. Young. It is a pebble, cut through the middle, exposing
the internal part of a sporange bearing exactly the form of this specie and is
figured pl 31 fig. 10. On both side of the broad mid rib which appear to be
a central axis there is a cavity filled with large spores nearly one millimeter
in diameter, apparently agglomerated originally but detached ~~up~~ and
irregularly strewn upon the specimen. Triangular on the lower side rounded
on the upper like seeds of large Lepidostrobus macrospores, larger than
any of those published in Schimper's Atlas. This organism is therefore
a sporange surrounded by a narrow border as fringe. ~~math drawing~~?
This is L. acuminatum Ben. Fossil. 1. 275 Pl. XVIII f. 2

2. Lepidophyllum lanceolatum ~~Lyg~~ Lindl. & Hutt. Foss. Flor. Vol. II. p. 114. pl. 144
from mineral spring (see f. 546. fig. 3. & 4. The blade is long
very narrow in the bar of the blade nearly flat ~~Lyg~~ Lyg. 10 ; ~~Lyg~~
from Chiphant. Shorter broad shorter acumen
Lepidophyllum lanceolatum
at length and abruptly narrowed Contracted top of the sporange
as in Mr Bisset's fig. Vol. 31 fig 8. I refer the specie fig. 11
Del Co. L.E. 10 L. majus? Brgt. The form is inverse, truncate points
& acuminate the acumen shorter and the sporange broader & shorter compared
& substance in Mr the cones were
12 N. 659 seems to represent

3 Lepidostrobus Witham Fossil Flor. Vol. 2, pl. 68. Fine specimen
Cone oblong ovate rapidely pointed 4 cent long 3/4th cent broad in
the middle Leaves closely imbricate 3 cent long 2 mill. broad, linear
pointed, midrib narrow but strongly marked. Resembles
Lepidostrobus Witham Fossil Flor. Vol. 2, pl. 68. Fine specimen
figured of this specie by Schimper: Another specimen 681
leaves more distinct, more loosely imbricated, only 2 cents long
the 681 the length was not very exactly measured the ground
covered: 2 cents. This to the same species.

4 Lepidostrobus ? Lepidophloios. ? spec. nov. Ms 484, 484a. 486. Renfrew
fragment of what appears to have been a large cone like that of Lepidophloios with
macrospore Pl. 68 f. 7a. The denudated surface of the cone is smooth and marked
as in the above figure by obscure rhomboidal pulvini. The leaves or blades attached
to what appears an exactly lineal lanceolate gradually narrowed to a sharp point,
apparently thick, broad nerved, the bases seems at the base 2½ millimeters broad
and the medial nerve one millimeter. It is generally flat but sometimes keeled
on the middle. The difference from this species with L. lanceolatum is in the
long blades not contracted upwards to an acumen but gradually and equally
lanceolate tapering from the base to a sharp point. Fig 486 represent
a fragment of bark of Lepidophloios ~~a~~ of a cone with the scars being covered with
the lacerated bases of the leaves or blades. This compares well with the cone figured
by Grand Eury as Sigillaria brobus regorsus & ~~macrocarpa~~. Pl XIV f. 4.

5 Lepidophyllum? Ms Pl. 46 f. Leaves exactly linear 1 cent. diameter, wrinkled across
especially along both borders and without middle nerve. They resemble bare leaves
of stigmaria but the wrinkles are very distinct nearly regular and nothing
like this has been observed by authors until now. at least to my knowledge

Knorria imbricata Hemd. Specimen in J.S Thorp collection has leaves more than two and an half cent. long linear, broken truncat at the top and enlarged to the point of attachement. They are more enlarg at the base and more distant than in Schimpers fig. Pl LXV.

2. Knorria acicularis, Gopp. Ta. 27. An instructive specimen in regard to the relation of Knorria. Its a branch or stem compresd 5 centimeters in diameter and two centimeters the other. On one side in the middle of the space the scars appeared in form of cylindrical acuminate projections about 1 cent long not quit two millim. thick at the base placed in spiral 4 cent distant in the direction of the spiral exactly similar to those of Pl XXX fig 30 Gopp Trans. Pl. from the transition formation of Silesia. On both sides of the flattened branch however these elevated linear scars disappear, being first replaced by shorter more enlarged convex scars little those of Knorria Schrammia Gopp. fig 4 of the same plat and farther to the borders by deep scars of Sigmaria minute or a species much like it which is represented in the same lot of specimens from Rockdale Mill by Dr. Dawson 28, 29 31 283. When the upper woody surface covering the scars is taken out the sub-surface appears finely granulat with shagreen. This specimen is very interesting and should be figured.

Knorria imbricata Hemd. Spec. 6006 of Lace a large number of flattened stems one of them 180 cent long, bare at the 1st articulation 55 cent wide at the second articulation, 40 cent from the first 17 cent wide at the next succeeding articulation 11 cent wide at the middle it is reduced to 3-5 cent wide at the middle of the internodal space. Flattened and is bisected only by an oval scar. Generally obtuse rounded at its termination. See figure p 3 No. 7. Always in spiral position. The scars prominent but not very large. The scars appear to be [illegible] more numerous than in Schimpers figure of the same species. It is not clear that there is a difference of the two species. Knorria imbricata is the more frequent [illegible] in the Rockdale Mill. It is distinguished from any of the other species by its flattened stem which [illegible] in the same direction as the leaves. Specimen broken both ends but [illegible] 1 foot. The scars [illegible] 1 cent. apart. Leaves [illegible] 2 cent. long, measure 1/2 cent to the point broken off. Stem when they are reduced to 5 cent wide. Stem flattened and [illegible] elegans and Meaninus [illegible] action of the stem. The scars [illegible] regular appearance spiral distant, round or oval, very small a little in the middle [illegible] simply pierced narrow [illegible] and [illegible] Specimen [illegible]

Lepidodendrids &c.

D1 Knorria. We have two fine specimens L 78 L 81. which in the verticated stalk show the cicatrices of a Lepidodendron exactly like some of the varieties referred to L. Sternbergii from Morris and which unite the bark as true Knorria. In this species which is interesting as proving against Schimper opinion the identity of Knorria and of Lepidodendron, the pulvini are not more elevated upon the bark than in any other species of Lepidodendron. They are inflated only under the bark and seem to raise up in growing. see Schp. Pal. veg. pl 65 fig 8.

D2 Knorria Hoffmanni Presl. Three large specimens in nearly cylindrical or somewhat flattened 1' foot long, four to 5 inch wide, marked in spiral by large scars of broken laterals nearly 3 centim. wide, 6 mill. deep in the middle part. The half round broken part [illegible] which is the base of the laterals there are at a most distance from each other; some of the scars which have not been broken show a large round cicatrice about like that of a Rhodea with a central point resembling a [illegible] that of a big mark surrounded by irregular wrinkles due to the divided [illegible] for the attachment. When articulated in correct by the axis which is less than one millim. thick, the cortex is [illegible] marked [illegible] by a point apparently corresponding with the centre of the scar? or generally more upon. No specimen Si 91. Another specimen shows in one part the scars (perhaps smaller) of broken laterals as in some, placed in the same direction while another part the branches are well preserved in some length in the form of round leaves of Hoffmanni, some of which are flattened against the stem while others are detached. The unbroken part is from 1½ to 2 cent. long contrary to these scars and as going out of them in a contrary direction the same specimens is covered with leaves of Hoffmanni. Another specimen L 71 L 72 shows the same appearance of broken scars or native scars of broken branches conical active, all turned in the same direction and all exactly in spiral line 1½ cent. distant with the upper scars still bearing flattened parts of what appear to have been broad leaves like that of Hoffmanni. The first specimen Si 91 may represent a distinct species remarkable for its very large scars. But some of the size of the scars Si 74 are intermediate in size to those of Si 72 and therefore all appear to represent only one species.

D3 Knorria imbricata Sternb. I refer to this species a portion of Stem L 12 which has the pulvini small, linear lanceolate, close to each other, all truncate they are 2 mill. long and 1½ millim. wide. This specimen is near Knorria cicatrisata Gopp. Uebergangsfl. p. 110 Tab. 30 fig 3 only with the pulvini more closely approached to each other. To this species also is referable L. 32. which I have figured and described in Rep. of the Ark's survey p. 611. pl 4 fig 1 as Diplotegium truncatum n. sp. and which much resembles Knorria (Diplotegium) Parkinsonii Sternb. (Versuche Flora der Vorwelt 2 pl. 49 fig 1) the pulvini slightly inflated near the base are abruptly truncate. see p. 445 cl. b.

D4 Knorria Sellonii Sternb. From the greater distance of the pulvini which are more pointed or prismatic nearer to the apex, Specimen Di 38 & Di 53 are referable to this species.

D5 Didymophyllum Schottini Gopp. One specimen of Sandstone L 13 has the pulvini broad short, but continuous, broadly oblong and cut or slightly emarginate at the point. They somewhat resemble those of D. Schottini as figured in Gopp. I never a species which Schimper places with Knorria imbricata. But the pulvini are short contiguous round at top. Perhaps a var. of Knorria imbricata.

Genus KNORRIA, Sternb. and Gopp.

Cicatrices half cylindrical, obtuse at the point, more or less enlarged downwards, like those which are indicated as the essential character of this genus, have been recognized as subcortical scars of some species of *Lepidodendron* by Prof. Goppert and other recent authors. We have seen the same also in our *Lepidodendron Morrisianum*, and in this Report still a specimen referable to *Sigillaria monostigma*, Lesqx., is figured, and bears the caudal intumescence of a *Knorria*. We have, therefore, abstained from describing any new species as referable to this genus, though we have in our Coal Measures the two species admitted to it by Goldenberg: *Knorria imbricata*, Sternb., mentioned in vol. ii, of this Report, and *Knorria Selloni*, Sternb., Vers., i, iv., p. 37, pl. 57, from the shales at Morris.

Genus SIGILLARIA, Brgt.

Ill. Geol. Rep., ii, p. 448.

Sigillaria corrugata, Sp. nov.

Pl. xxiv, fig. 4, and Pl. xxv, fig. 5.

Cortex very rugose or deeply wrinkled in the length, marked by linear-oval, elongated cicatrices, gibbous in the middle and cut by a round angular scar, as seen pl. xxv, fig. 5. Lower surface also wrinkled lengthwise with smooth, shallow striæ, marked by cicatrices, oval in outline or somewhat pointed at the top, rounded in its lower part, marked in the middle by three irregular, vascular scars, placed in the shape of a horse-shoe, or by a semi-lunar scar which points downwards, and a mere vascular point underneath. These cicatrices are one inch long, half an inch broad, distant, and placed in quaternate order.

This species resembles a *Lepidodendron*, appearing related to *L. punctatum*, Sternb., which Prof. Brongniart considers a *Sigillaria*. Its leaf scars have more analogy to those of the last genus.

Found at Marseilles, LaSalle Co., at the base of the thick bank of sandstone which there appears to take the place of the lower coal strata, and which generally contains remains of large species of plants, rarely in a good state of preservation.

Sigillaria Massiliensis, Sp. nov.

Pl. xxv, fig. 3 and 4.

Stem ribbed, ribs flat, half an inch broad, with intermediate, deep, sharply cut furrows; surface striated lengthwise by distinct, nearly continuous lines, scarcely flexuous on the borders of the cicatrices; cicatrices larger, one-third of an inch long, not quite as broad or half as broad as the ribs, rhomboidal, rounded at the top, enlarged downwards to the angular sides, obtusely pointed at the base, minutely, obscurely striate on the surface; vascular scars three, the lateral ones semi-lunar, caudate, vertical; the medial one horizontal, large, oval. The cicatrices are separated from each other by a space equal to their length. The form of the decorticated cicatrices is not known.

This fine species is allied to *Sigillaria intermedia*, Brgt., differing in its proportionally larger cicatrices, and by the regular striation of the ribs, without cross wrinkles at the base of the cicatrices, and by their angular base.

In the sandstone at Marseilles.

Sigillaria monostigma, Lesqx.

Pl. xxvi, fig 5.

This species is referred, with some doubt, to the one published in vol. ii of this Report, p. 449, pl. 42. It represents a part of a trunk or branch, four inches broad, flattened to one-half an inch in thickness, marked all around in the general quincunxial order by broadly rhomboidal scars, with a round point in the middle, exactly of the same form as those of the cortex of *Sigillaria monostigma*, and at the same comparative distance. These scars are placed at the top of an inflated lanceolate cauda, three-fourths of an inch long. This kind of half cylindrical appendage attached to the specimen evidently under the cortex, gives to this species the character of a *Knorria*. If, as Prof. W. P. Shimper will have it, in his *Vegetaux fossiles du terrain de Transition des Vosges*, p. 33, *Knorria*, as a genus, differs essentially from *Lepidodendron* by the cicatrices having a single central vascular scar, our species should be considered as a true *Knorria*. But the same author denies the existence of any

Sigillaria. In the distribution of the species of this genus I propose simplification with some remarks of species

Sigillaria [illegible] to him. Schimper says he is appointed of the species the following species of authors, of which we have specimens. - 1. Sig. [illegible] Lud. Lud. Sig. [illegible] with [illegible] and [illegible] scars. [illegible] with [illegible] [illegible] 16 or Gold. not ovoidal scars. 2. Sigillaria elegans Brgt. with rows of [illegible] enlarged on the sides, much like S. but without costa. The specimen [illegible] articulations of [illegible] and one of them is [illegible] Stem 517 [illegible] these articulations inflated or [illegible] inflated [illegible] around where [illegible] [illegible] [illegible] marked, the stem is [illegible] [illegible] these [illegible] appear only with [illegible] [illegible] regularly placed in relation [illegible] [illegible] them. 3 Sigillaria [illegible] [illegible] small specimen exactly corresponding with Gold. fig. 17 [illegible] 16 Sigillaria [illegible] Brgt. [illegible] with more [illegible] [illegible] as in the figure of the [illegible] [illegible] [illegible] specimen. 5 Sigillaria ornata Brgt. [illegible] specimen No 86 [illegible] [illegible] and [illegible] [illegible] [illegible] the figure [illegible] the [illegible] [illegible] Schimper [illegible] [illegible] [illegible] 67 fig 5.

D2 Sigillaria Dournaisi Brgt. [illegible] the scalariae are [illegible] as in the figure [illegible] Brgt. [illegible] of Goldenberg, the specimens [illegible] appear to belong to this species. In one [illegible] the scars is [illegible] [illegible].

D3 Sigillaria mamillaris? Brgt. To this species I refer with doubt two fine specimens No 63 & 63.6 & No y2 & y2.6 Sub millstone grit coal (see catal.) [illegible] are much like Gold. fig 8 pl. 1. 8 however showing the cicatrices always arranged into an angle [illegible] the middle and [illegible] rounded at base. There is scarcely any difference. In 92 & y2.6 specimens of Lesley the scars of the scars are [illegible] from the point to the base, the [illegible] [illegible] [illegible]

European authors and of mine too should be erased or united with others. Nos 47 & 48 are decorticated and doubt, only, parable to this. The scars are arranged by exact zonigle joints &c.

9 Sigillaria intermedia Brgt. Only decorticated specimens.

D.11 Sigillaria tessellata Brgt. Also merely decorticated specimen. I put all together under this name. The specimen in the Coal Mus., Longton, double & magnified scars, and figure more or less distinctly what. Some of the specimens are referable to Sigillaria elongata Brgt. from the S. calamitoides

D11 Sigillaria ampla Mus. Represented like the former only by decorticated specimens. I refer to this species all the forms marked by two large nearly round scars with longitudinal or upturned specimen is remarkable for its very deeply pitted large scars not in outline scarcely emarginated marked near the borders by a very emarginate upward and to the middle of an upward or convex furrow specimens are very similar in figure 12 p. 52 &c. The impressions of the specimen is deeply mutilated everywhere but in contact, the scars alternate vertically 2 decim. distant, horizontally 3½ cent. from one side to the next & 4½ centim. from center to center.

12 Sigillaria Lindleyana Schp. Specimen rather square & 4" tall & fine specimen of Lindleyana S. 11. which is figured in my plates fig 11 & fig. Pl 9 fig 2 as Sigillaria cyclostigma Brgt. Compare Pl 2 Pl 11. Organization of it is not S. cyclostigma any how.

13 Sigillaria Sternbergii Schp. Sigillaria Brongniartii Sch.? Fine specimen S. 25 which is figured in U.S. on pl 11 fig 3. as Syr. pachyderma.

14 Lepidodendron Sternbergii Cauloides Gein. as figured in Gein. Leit. fig 5.

15 S. 4 Sulcata Mus. 1. specimen the rest 27 fig 14 nothing to add.

16 Sigillaria notata Brgt. One specimen S. 15 a very fine one showing apparently a dichotomous branches or branches diverging from each other precisely at right angle is referable to this species. Agrees with Brongniart figure 10 pl. 153 and with Schimpers description Vol. 2 or No. 4 p. 87. Nothing there is mentioned in Brongniart figure nor in Schimpers description any remarks about the decorticated state of the species which is especially seen from our specimens, the scars being represented by two oval small mamillae like these 00. The decorticated scars are seen only upon a part of the specimen agreeing with the form of Brongniarts figure but small. Specimen S. 31 which is decorticated is referable to this species with doubt.

D.17 Sigillaria reticulata Lyell. Am. Geol Rept. p 310, pl 3 fig 2. The figure is good. The description mentions the scars as being rhomboidal which they are generally not. We have three specimens of this species which though comparable to the following is yet different by the form of scars & reticulation see p 438 1.

18 Sigillaria rhombifera Brgt. A good specimen agreeing in 36 with Brongniarts fig 2 figure and Schimpers description figure in which is equal to S. elegans Mus.

D.19 Sigillaria Sternbergiana Brgt? This specimen S. 25 is intermediate between this species and S. Lepidodendrifolia or even S. reticulata. Has evidently sculpture but the furrows are not distinct as Schimper says; they are mostly obsolete, sometimes totally wanting or running out of the side at time. The specimen in the decorticated state is strongly wrinkled longitudinally; the scars somewhat smaller with more acute side borders as in Brongniarts figure, exactly

as in Goldenberg's fig 1 of pl 9 this species and also that of Bronguiart do not show a strongly winkled surface. May be a new species, marked Schlotheimia type

21 Sigillaria reticulata Rost. scars arrow narrowly oval, 1 cent long & 4 mill wide bearded in the center by an obscure point, striate lengthwise as is also but more coarsely the space between the scars. Differs from Bronguiart species by narrower striate scars at a less distance and somewhat irregular in position. Specimen not quite good enough for the scars as distinct, detached for the nature is rightly appreciated in figures.

21 Sigillaria monostigma Lesq. Nothing to add to figure and description. Specimens No 53 & 102 are added to this species with doubt. decorticated Lebanon.

22. Sigillaria subpl. Sigillaria favularis Lesq may be the same species but the characters as marked in figures & description Penn. Dept. may be true description or authors figures they are exactly matched in the museum has good specimens of it. I want to see specimens a number of decorticated specimens. No 19, 446 where scars are marked by a single large round point & with surface nearly smooth or narrowly striate. A few scars we see just flat upon the part of one specimen appearing like that of fig 4a in Bronguiart fossil which has scars of 2 rhomboidal. Other specimen from this position round point which I have not seen in any species of this section may represent a new species.

23 Sigillaria stellata Lesq. Good species. The museum has three good specimens. Description in Geol. Rept of Penn. p 811 is corrected in Rep. exp. Fig. 5 pl 13 is incorrect.

24 Sigillaria Schimperi Lesq. Is a remarkable species. The specimen will not, not show anything more than is figured and described in Penn. Geol Rept I have corrected the description. Showing the lower part of the scales & areas and the scars too, & and perhaps it might be represented thus. But though it may be, nothing is yet published & comparable to it.

25. Sigillaria depilo dendrifolia Brt. The museum has one specimen No 1105 from Mazon the only Sigillaria I have met with in the place, which by the regularity of position of the scar is referable to this species. The scars themselves are smaller and then form variable, generally nearly round oval, specimens more or less elongated by compression & show the transform of scars as in Bronguiart. Scars are not only smaller.

26 Sigillaria stellata Lesq. Nothing to add to description Geol Rept of Penn. a very fine species, quite right. The cicatrix depressed at the summit. The rhomboidal scar is not a scar. The middle scar is near to the middle of the lateral ones.

27 Sigillaria mutilata Lesq. Rep 2 pp 531. an S. obovata? compare. a large stem the flattened fragment 15 cent broad with 15 rib. convex striated along the borders granulose or wrinkled under the scar. Scars broadly romboidal small round, enlarged at base 3 / cent distant. marked in the upper part with a round point and two descending cicatrices appendages. Marsh Chenett in Leroy collection. S. ? Decorticated a.
see p. 447 [13.]

28. Sigillaria. from Marsh Chenett Leroy coll. Rubbers. Specimen 2 cent broad. 1 cent or a little more flat concave. Scars close, 1 cent distant, decurrent oval emarginated at top, round at base with a large central point. It has a very large number of specimens. See No 446 . 28a

446c and two thecll oral or semilunar appendages, a bell side. Cortex under the surface is regularly and clearly striated without any trace of scars or with an obscurely scars marking the central point and the appendages see figure. In the decorticate state, the ribs are smooth.

1 Sigillaria remiformis Brgt. Reticellaceae a large specimen in Lesley coll. has the scars as marked in p 531 fig 4. the scars at an horizontal distance of 2 cent. and at a vertical distance of only 2 cent. The specimen is large, quite flat. The lower part has the place of the scars marked by a more regularly oval convex protuberance and the surface of the whole specimen regularly and equally striate see p. 481 c 3

2 Sigillaria alternans St & Hutt. A very large specimen in Lesley collection has double scars W 2 cent long, at the same vertical distance of 2 cent, the rib 5 cent wide the whole covered by a carbonaceous layer 3 to 4 mill. thick whose surface is obscurely but regularly striate See page 481 c 3

3 Sigillaria elegans ?? Compare and determine. May be S. stellata. S. stellata. The specimen represents upon a large surface the three kinds of scars marked upon the figure p 531. f. 4.

4 Sigillaria sp. nov. Hardeni a large trunk 45 cent wide flattened to a thickness of 5 cent. Surface double, the upper one ribbed, ribs flat, 2 cent wide undulately striate or wrinkled indirectly marked by scars like figure p 531. f. 5 a nearly round areola covered by horizontal lines with a slightly protuberant point in the middle. Decorticated surface ribbed equally but with thin striae; the scar marked only by a point (~~only by a vertical pores a side~~ (very fine) ~~This is remarkable proving that the subcortical form of the point is no good character~~). The fault is this, the upper one 2 cm wide, the lower one half as much.

5 Sigillaria S. f. 9. of Lesley no 60. marked ribs narrow convex somewhat high. Scars decurrent close to each other. 1 cent long 1 cent distance see fig 6 of f. 531. The surface is not striated. Bark thick, surface of the bark thinly striated but without scars. lower part an elongated point as marked in figure p 531 fig 3. a, b and c

6 Sigillaria N 27. has a large number of large specimen some of them have the ribs nearly twice as large 1 3/4 cent. the scars broader but of the same form and not quite as distant 3/4 cent. from central scar to central scar, regularly and thinly striate in the bark. See Sigillaria attenuata Cat Foss. p. 17. #1.

7 Sigillaria Wardlegi N 24. Easton College. Has large specimen with ribs smooth as large as those of this species but the decorticate surface or some ribs O strongly oval and on others double OO Under a more careful observation this is regularly S. alternans the scars become longer and irregular in form O

#1. It is to mention the copper scar upon the striated surface of the gates.

specimen showing, at the same time, the character of *Lepidodendron*, or the three vascular scars of the leaves and the semi-cylindrical and subcortical appendages of a *Knorria*. These we have evidently in our *Lepidodendron Morisianum*. The value, therefore, of the genus *Knorria*, and its true characters, are still questionable and open to discussion.

Colchester and Morris.

Sigillaria alternans, Ll. and Hutt.

Foss. Fl. 1, pl. 56.

A remarkable specimen of this species has been found upon a piece of coal at Morris, by Mr. S. S. Strong. In its lower part it shows the row of double scars separated by a space of half an inch, elongated and irregularly oval. In ascending, the scars approach insensibly till they pass to a row of single ovate pointed cicatrices, joined together by their ends with an oval depression in the middle. This last representation of *Sigillaria alternans*, Ll. and Hutt., is exactly *Sigillaria catenulata* of the same authors, Foss. Flor. 1, pl. 58, and therefore both species ought to be united in one, as is done by Goldenberg.

Sigillaria spinulosa, Germ. in Gold.

P. 20, Pl. 10, fig. 4.

Our species merely differs by the lateral angles of the cicatrices being slightly obtuse and not acute, as figured and described in the European species. There is no trace of scars of spines. It may be a different and a new species, but it is on a piece of coal, decorticated, and all the details of structure cannot be recognized.

Carmi, White county; collected by E. T. Cox.

Sigillaria Cistii, Brgt.

Veg. Foss. 1, p. 418, Pl. 140, fig. 2.

This species is placed in the genus *Stemmatopteris* by Corda, and appears to be a true *Caulopteris*. Mr. Bradley has found at Morris a specimen referable to this species; but it has only one scar, and from it to the base of the specimen there is a surface half a foot long, without trace of any other scar. The whole surface is ribbed or striated as in Brongniart's figure, the striæ curving and uniting under the scars.

Genus SYRINGODENDRON, Sternb. and Brgt.

Ill. Geol. Report, vol. ii, p. 451.

Syringodendron pes-capreoli, Sternb.

Vers. 1, 4 ; p. 24.

In shales at Grayville ; collected by E. T. Cox.

Syringodendron Porteri, Sp. nov.

Pl. xxvii, fig. 4 to 6.

Stem round and thick. (The State cabinet at Springfield has a branch four inches in diameter, and another double this thickness.) Surface covered with scars placed close to each other in vertical rows, no more than one-sixth of an inch distant, the horizontal space between the rows double as large, filled with vertical parallel and continuous lines or narrow wrinkles close to each other. Scars small, scarcely one-twelfth of an inch across, round, marked in the middle by a vascular depression, overtopped by a convex or semi-lunar deep cavity, which gives to the scars the appearance of an open eye, fig. 6. This line either divides the round scar at its top, or passes a little above it. These scars have the form of those on *Syringodendron cyclostigma*, Brgt., and the striæ of the surface are also of the same kind in both species.

But this species greatly differs by its closely approached scars, and especially by the absence of the intermediate furrows. This character might even prevent the admission of the species into this genus. If, as I am informed, there is a specimen (which I have not seen), found in connection with those examined for this description, and which is abruptly strangulated and reduced to half its diameter, a form indicating a root rather than a branch, this species should be admitted into the following genus.

Found at Eugene, Ind., and presented to the State cabinet by Mr. Isaac Porter.

lewdesme might this be a Lepidodendron? Coll d. Weltheimerum.

1. Sigillaria sp. nova? (Blackville Fort Cabor) in Cabinet of Lafayette College. Stem apparently large. Scars oval slightly acute on one side, rounded at the other 1½ cent long 1 cent. wide and 1 cent distant. The surface appears granulose and the bolsters are marked in the middle or above it by a scar V Fig. p. 531 fig. 9.

2. S. sp. nov.? a large specimen in the Garden museum of Paxton. I copy a few scars fig. 11. p. 531 an S. finei? compare S. fissa is represented also in Lorem, collection at Chesnut Hill under No. 28.

3 Sigillaria Schimperi? See p. 531 fig 12 Two finely preserved, corticated large specimen of Sigillaria might perhaps be referable to S. Schimperi. The bolsters are deeply imprened into the stem, large 1 cent, as seen in the figure rhomboidal, obtuse up and down, acute at both sides with two oval vascular scars and a semilunar one under them. The surface is regularly and clearly striate the scars by their depression seem surrounded by a frame whose sides are oblique or pass down from the surface to the borders. Compare Sigillaria Schimperi — See p. 449 col 1

4. Sigillaria (genus.) see remarks of Brongniart in Mem. to Grand Eury p. 160 (1)

5 Sigillaria Brardei Brongniart? Ref 2 Goldenb. 1. Numerous specimen corticated and decorticated. This N. 1 which would be frequent resemble mines had to the species as figured and described by Germar VIII fig 1, especially the part on the left of the figure. But it differs from this as well as from Brongniart and Goldenberg figure 6 the scars descend to the stem narrower though of the same form (O) placed at the top of a much longer plane bolster and accordingly the space between the scars is also between two large ones in German being three millimeters and in our 5. Goldenberg & Brgts figures have the same distance; but the scars and bolsters are twice as large as in ours; they are moreover placed in the middle of the spaces whereas we have ours at the top or nearly so. There is a character found in this species of Alabama common with S. Brardei as figured by Germar, it is the equal lines which cover as an epidermis the corticated part. In this specimens the lines are extremely thin and are equally the intervals, the plane and the bolsters. May be and is probably a new species. The specimens are marked Ad. 1 to 4. N. 4 is part of a small half cylindrical stem, flat and corticated on one side, decorticated on the other and there marked with small punctiform elevated scars closely placed in spiral, four millim distance in following the spiral generally marked with a circular small scar at the top This specimen resembles somewhat a Halonia, But is evidently a form of these Sigillaria for the flat side of the same branch has the scars of S. Brardei? as described above.

6 Sigillaria Brardei a new? same as N. 5 I refer to this two large flattened stems of Sigillaria, 30 centim. broad marked like N. 4 with upraised half ovoid bolsters split at the top, 13 millim distant in following the spiral line and nearly as broad, the whole surface being narrowly lined or striated in the same way but less distinctly as in the specimen 1-3. The corticated part is covered with a thick coating of coal 2 mill thick when surface is covered with round slightly elevated bolsters flattened at top without scar but of the same size and distribution than on the other side. I wonder then they are the same.

see Sigillaria reticulata p. 481 col 1.

(1) Syringodendron Brgt. (Genus) Le Bryt. in Grand Eury, mem. p. 17 (2).

2. Sigillaria tenellata. Brgt. A fine specimen No 9 sent from Illinois Tyler Mc Wynter from low coal measure represent the species very probably. The bolsters are however somewhat larger than figured by Brgt 8 millim. long, just 10 mill broad at the middle angle, 3 mill vertical distance and a rule of the same width between them. Form of the bolster exactly like the fig. of Brgt especially enlarged fig. 1a of Pl 156. The vascular scars enlarged or inflated up and turned inside or outside as mather. Brgt with a transversal line or a point in the middle, rather a point all the lines assumed. The bolsters are sharpt, the lower in some time a little curved outside (3) the vascular scars nearly in the middles. They agree exactly with the description of S. Tenellata in Schimper Pal. vegt III p. 81. to which he adds as synon. S. tenella S. microtigma Syringodendron pachyderma S. hexagona! S elegans Pl 146 1. S. alveolaris Pl 147. 5. S Ichthyolepis, Corda Beitr. S. minima & S. ornata Brgt. etc. and probably S. Dournaisii Brgt. see 4746 (3)

3. Sigillaria spec. nova? like S. Dawsonii No 10 of the same contributor as 2. is deeply narrowly grooved, the grooves two millim broad and as deep; cortex narrow about 5 mill or a little less pulvini oval oblong truncat at the top, rounded at the bar, contiguous, filling entirely the cortex vascular scar above the middle in the form of a horseshoe (3) The bolsters are seven millim. long 4 millim broad towards the bar which is much inflated. The epidermis is destroyed but where it is left they appear finely striate same type as Dawsonii, Dournaisii tenellata. The specimen is a branch nearly cylindrical, 4½ cent thick very regularly costat around.

4. Sigillaria spec. nova or Dawsonii? reniformis in alby S. laevigata. Stem very large. Ribs flat 7 cent? separated by a deep groove a double groove (3) The distance from the pores across the ribs is marked on the paper herewith 7 squares or 2 cent. about 4½ cent. The scars are a distance of three of these squares, nearly circular, more enlarged on the sides, slightly emarginate upwards at the top and round at the base. See fig. 1 p. 532. marked in the centre by two semilunar scars in the barred in the middle. The surface is irregularly distantly and obscurely striate in the length. Specimen No 49. in the Hale cabinet of New Brunswick, New Jersey Evidently S. reniformis Brgt.

5. Sigillaria Dawsonii spec. nov. A species closely allied to Sigillaria obliqua merely differing by the form of the bolster, narrowly oval elongated acuminated at both sides, rounded above and below. The middle scar (-) and also the relative distance of the bolsters are of the same nature or character; but the bolsters are much larger. The specimen in the collection of Mr Lowry at Chestnut Hill near Philadelphia is very large and the bolsters very distinct as figured on the paper herewith. The fragment of the species given to me No 5 is not quite so distinctly characterized. The surface is regularly striate or undulations on both sides of the Bolsters.

1. Sigillaria monostigma Lqx. In the mansfield collection, there are four specimens Nos. 67, a. b. c. representing this specie in better specimens than the ones figured in the 2nd. vol. of the Geol Rep of Illinois. The best preserved ones 67 a & 67 b with the epidermis upon them show the scars a little fig. 1 pl. 42 of the Rep. the striæ or straight wrinkle spaces from the bolsters obliquely being still more defined. The distance of the bolsters in following the oblique lines varies from 1 to 2 centimeters. These bolsters are in general much smaller than in fig. 1. more acute at the top ◇ sometimes, at least but generally as in fig. 3, mostly when the epidermis is upon them with a long round vascular scar at the top ◎ extended downward by a large circle which bears at the base trace of a second vascular scar. When the epidermis is gone as in No. 67 b. the upper scar is a small round mamilla and the middle one a point deeply marked two vascular scars sometimes covered by a small mamilla. This fine specie is very variable and should be figured again. In the specimen fig 76 has the scars nearer to each others and shows them by decurrent lines as in fig. 4 of my plate loc. cit. — Specimen No 96 represent the specie fully preserved with a small vascular point in the middle of the bolsters and sometimes another with an upraised gland just above it ◎ The middle one is depressed, the upper one elevated.

2. Sigillaria elliptica Brgt. No 83 from Carnallton as in the collection of Mansfield though the stone is different and coarser than the other specimen. The scars are very deep somewhat obscure due to each others. The ribs distinct undulating and narrow only 7 millim distance, the scars being 5 mill broad. The vascular scars are like Brongniart's figure of this specie.

3. Sigillaria Yardleyi Lqx. I have found at Baust gap, a very fine specimen Lx 1649 of this specie. It is in entire concordance with the specie published in my Catalogue of Dolterville under the name, the scars very distinct of the same form, covered in places with a thin striate coating of coal. Another specimen Lx 1660 a has this coating more general upon one side of the specimen and there the oval angle scar is represented as in my figure as also the striate surface. The reverse of the specimen has apparently the same specie; but the distance between the ribs is not as broad, only 13 to 14 millim; in the other specimen it is 18. The ribs are less regularly parallel, the scars not quite as large but slightly more elongated. I consider it as the same specie. The form of the scars being the same. In my specimen figured for the Catalogue, the lateral vascular scars are turned outside; in these specimens they are parallel.

4. Sigillaria Catenulata L. & Hutt. is not described in Schimper's Veg. Pal. It is very common in the low coal of the anthracite. A number of specimens got at Baust creek Lx 1601 to 1604 represent this specie with strong half round ribs distant 3 cent. the bolsters mamillate convex in the middle

of the space sometime separated, sometime united end to end forming in the middle of the ridge where the separation of the rows is marked by a more slight depression or even not at all the bolsters being more elevated and broader than the ridges costæ.

1. Sigillaria Schimperi Zeiller. The specimen fig. p. 531 fig. 12 and and considered p. 448 (3) as perhaps referable to this species is certainly not. I have apparently found this species in specimen N° 1611 from Morris (green & thin) a fragment of shale bearing remarkable forms of bolsters which decorticated appear to represent the fig. 1 pl. XIV of the Penn. Report. The bolsters are placed in spiral order, at a short distance from each other, 2 cent, broadly rhomboidal, enlarged on both sides, 2 cent broad, rounded upward cuneate or pointed at the base, convex, mamillate in the middle with a large central regular point of attachment when decorticated, marked by a large central point except the bolster which can above is separated by a space figure. The whole surface is covered with short appressed lanceolate scales thin leaves, half a cent long, ¼ millim broad at the base, thrice as long, generally marked with a thick nerve in the middle, membranaceous, pressed all around the bolsters mostly upwards. The epidermis or scaly coating covering the bolsters is of the same thick texture, the upper part being covered by the appressed scales which the lower is denuded or with short scales. These scales fill also the space between the bolsters. It is difficult to give an idea of the appearance of the specimen which should be figured. It rather resembles a Lepidophloios or to form new genus of plant than a Sigillaria. It has some likeness to Lepidophloios laricinum as figured in Schimper's Atlas, Pl 59 fig 4 & 6 & 8 & 11. My sigillaria Schimperi seems to be nothing else but large decorticated scars of Lepidodendron Penn. Rep. Syst. pl XI-II f. 2, 3, 4.

2. Sigillaria rhombidea Brgt. N° 22 of the Museum is perhaps a representative of this species. The surface is closely distinctly even deeply narrow lyrate under the coal epidermis. The scars distant 1½ centimeter per cent to cent large rounded up (1-) as large as this. The surface lines are nearly straight not undulated around the scars. See specimen

3. Sigillaria Sarlii Brgt. Lacoe specimen N° 332, 333 represent a small part of this species. It is only one and an half centim broad and bi dichotomously branched. Therefore it must be a Lepidodendron. But the leaf scars are exactly like those of S. Sarlii figured in Brgt still more enlarged on the borders as this but not as large. It may be figured. See p 488

4. Syringodendron pachyderma Brgt. As represented by specimen 498 of Lacoe. The specimen is as it has figured it in Pl. 24 fig 3 & 3a. It differs much from that of Brongniart which has the ribs only half as broad a distinct fascicle of striæ running up and down from the decorticated central point and more marked or deeply striated in the middle than at the borders of the ribs and the surface of the cortex marked by a tubercle duplo longer than in this American form. It is well to remark however that in this specimen from Lacoe there is upwards either from both side of the decorticated scar two thicker lines ascending to two or three millimeter or a single one from the middle. This character is marked upon my figure Brongniart figure has the ribs 1 cent broad. The figured specimen has them 12 millimeters and in Lacoe specimen they are 1½ cent. This can not constitute a specific difference. The Bark in Lacoe specimen is 5 millimeters thick.

See for Sigillaria p 480 a 474 a

Syringodendron cyclostigma, Brgt.

Hist. Veg. Foss, p. 480, Pl. 166, fig. 2 and 3.

Found at Alton, by Mr. H. A. Green.

Genus SIGILLARIOIDES, Lesqx.

Cylindrical roots or stems ? variable in size, marked on the surface either by round scars, without trace of a central vascular point, placed in a regular quincunxial or spiral order, or by defined *Sigillarioid* cicatrices with a central vascular point, without any regular order of position in relation to each other. To this genus are referable the remains of what I consider as roots of *Sigillaria*.

Sigillarioides radicans, Sp. nov.

Pl. xxxi, fig. 4.

Primary axis cylindrical, about one inch broad, irregularly inflated and strangulated towards the narrower base, bearing long tubular rootlets or leaves attached to rhomboidal cicatrices, which are narrowed on both acute sides, and marked in the middle by a broad vascular point; leaves or rootlets more than one line broad, marked in the middle by a vascular line or medial nerve. The scars are tolerably distant, and without any regularity of position relatively to each other. Though slightly variable in their form, they are so remarkably similar to those of *Sigillaria monostigma*, that the intimate relation of these remains cannot well be doubted. This specimen is interesting, especially as seemingly indicating a similarity of scars between some species of trees of the Coal Measures and their roots.

Mazon creek; in clay iron-stone nodules.

Sigillarioides stellaris, Sp. nov.

Pl. xxix, fig. 3.

Stem cylindrical, half a foot in diameter, irregularly inflated and contracted, obliquely crossing the shale, marked on its surface by small, round, slightly angular, sometimes nearly square or triangular cicatrices, in exact quincunxial order. These are slightly upraised above the surface, truncate, without trace of vascular point. Surface obscurely wrinkled between the scars, with lines diverging starlike toward the nearest cicatrices.

This beautiful specimen, figured half its size, evidently represents part of a root of a large *Sigillaria*. Its oblique position in the shale is marked by the upper and lower flattened surface, to which the direction of the stem is at an angle of thirty degrees. The inflation and contraction of the cylinder, which is irregularly strangulated, indicates also a tree's root. The scars placed in regular order, though double the size marked in the figure, are much smaller than cicatrices of *Stigmaria*. In the strangulated part of the cylinder, some of these cicatrices are deeply immersed in the stone, and do not show, any more than those which are slightly upraised above the surface, any trace of a mammilla or central point. The wrinkles of the surface and their direction resemble those of *Stigmaria anabathra* var. *stellaris*, Gopp.

Found in the roof shale of the coal at Morris; by Mr. Jos. Even.

Genus HALONIA, Ll. and Hutt.

Foss. Flor. 2, p. 12.

This genus represents aborescent stems bearing two kinds of cicatrices; small ones, like round or rhomboidal points closely approached, disposed in regular spiral order around the stem; large ones more distant, upraised like half round, obtuse tubercles, disposed about in quincunxial order.

1 Halonia. Of this genus, the museum has only the species which I have figured as H. pulchella Ad Lh Rep! p. 311 Pl. 3 fig. 3 and the specimen is rotten. However a hole in fig. 30 [illegible] shows exactly what is seen in my figure or which a more detailed description can be made. That is marked as showing showing point of attach of a branch may be merely a small iron pyrite or its place!

Cyclocladia. ? species. Specimen from Lacue 451 represents a branch like that of Halonia or Ulodendron. It is quite flattened. 7/ cent broad marked in the middle and on both sides by round circular scars, the outside obscure circle 22 millim broad, elevated in the middle as these marked by a distinct circular umbonate scars 6 millim diameter with a deep depression or hole in the middle and no trace of a central point. The distance from center to center of the depressions or scars is 4 millim cent. and from border to border of the outside undistinct rings 17-18 millimeters. The bolt scars are undistinct but apparently of the same form as in Ulodendron minus covered by a pellicle of coaly matter irregularly minutely punctate or transversally rugulose. By the form of the bolsters and of the scars this species is somewhat like Cyclocladia ornata of Gold. Pl III fig. 11. c. But the bolsters are only outrow rows and by this it is more like ulodendron flexuosum of the same author Pl 2 fig 10. a species which is not mentioned by Schimper. [illegible] put this to H. Mansfeldi?

3. Halonia tortuosa? Al. Ad. Specimen No. 367. represent a small branch, positively referable to Pl 9 fig 2 of my plat, having exactly the same character but with the bark still preserved and therefore the original form of the scars. The specimen is ten cent long, one and an half cent broad. with alternate knots on each side just as marked upon my figure, these knots bearing upon their surface trace of scars of the same character as those of the main branch but not as well defined. It appear therefore that they are not lateral remains of branches or of fructification but merely adventive buds. The bolsters are rhomboidal square with inflated borders and an inflated [illegible] central mamelle. The specimen should be figured.

4. Halonia gracilis, Al Ad. I have a specimen. N° 5X1 of Lacue which seems to explain this species of Lindley, a branch 2 cent broad 6 cent long with close rhomboidal scars just like those of Sigillaria Brardei and small circular scars of branches about 3 cent. distant 4 millim. broad with a central point ⊛ and a little oblong scar or around the point. This is most evidently Ulodendron majus. Al Ad. the scars are exactly like those of my fig. 1 Pl. Rep IV pl. 22 fig. 4 a.

1. Halonia tuberculata Dest. The figure of Gopp. in Flore der Uebergangs. pl XXVIII fig. 3 is more comparable to ours than that of Dest. The tubercles appear hollow in the center. Compare Halonia regularis in Binney. Part III, 1872.

2 Dechenia Euphorbioides, Gopp. Gatt. Hft. 3,4. pl. 3. fig. 1. appear to be the same as those representation of agglomerations of ~~ribbed~~ ovoid tubercles found so commonly in the Anthracit of Penn. I have seen them often and considered them generally as inorganic. Goppert considers them as bolsters upon the bark of some trees like Araucaria. see Gatt-loc. cit. p. 43. I have in black band iron ore a fine specimen from Wm Gifford. Also which present the characters of Dechenia as figured by Gopp. Gatt. l. 3 & 4. Pl III fig. 1. The bolsters are however much longer from 4 to 6 cent long very irregularly oval. often one side, narrowed at the other about 2½ cent. broad. situated ~~on~~ regularly or about regularly in undulated lines like those of Calamites the ribs about 1 millim broad convex with deep intermediate lines. The surface is smooth, leathery. This is like the bark of some trees or the skins of great saurians; too irregular for that of animal. The relation to Dechenia of Goppert is advisable. Name H. D. striata. The ribs are more or less bolster across or in right angle by small wrinkles or rugose; the bolsters seem as superposed irregularly compressed and pushed aside by contact. The representation fig. 3 is exactly like Sigillaria deplodermis Brd. in Bit. Carcap. Pl 10 fig. 8. I mark this figured.

3. Halonia secreta - Spec. nov. Specimen from Wm Gifford, returned. The specimen is long. 30 cent. and from information more fragment still are in the possession of the owner, exactly linear, 5 ½ cent - broad reduced by compression and flattened to about 1 cent. in the stem. Bolsters ~~convex~~ convex, ~~embraced from~~ ~~Probably~~ 1 cent. broad, even to 8 millimeters in vertical diameter, forming a convex smooth surface slightly elevated above the surface of the stem which is equally smooth and without distinct joints or with merely slight irregular rugosities. Bolsters placed in spiral close one centimeter distant from center to center in the direction of the spire, formed of a hard stony pellicle or bark which where broken shows a deep cavity mostly filled with carbonaceous dusty matter which easily comes out of the cavities and when taken out leaves in view an elongated linear depression fig. 1 a. marked with three points in horizontal line similar to the three vascular points or scars of Lepidodendron. The elevation of the closed bolsters above the surface is about one to two millim not more and the tubercles are flat or convex, not half globular as in other species of Halonia. Three bolsters are in a turn of spire around the stem having between the corresponding upper and lower points or bolsters 5 ranges which makes distributed of 5 & 11 - See on the subject of Halonia what Schimper says. He compares the closed bolsters to abortive (mamelons) etc. This opinion seems contradicted by what we have here a part of stem or a symposium which represents unopened or abortive buds? which seems to correspond to kinds of organs like those of leaves of Lepidodendron. It would indeed be easy to see in this part of stem a Lepidodendron whose leaves unopened and covered perhaps under ground or in water has grown like the ordinary branched Lepidodendrons enlarging the bolster with age and not at all what Schimper thinks of the scars or bolsters of branches and leaves. See Halonia tuberculata Pl XXIX of this vol. and Halonia Tokosa in C.B. 841.21 H.D.3 p. 38. Compare H. tuberculata in Stur Pl. of Boca Grand, and Pl. which appears to have covered stem.

Stigmaria

D1 Stigmaria ? fragment. Stem. Specimen St 6. shows on its upper part, flattened surface the scars of the roots, somewhat larger than they are generally and on the under side a flattened narrowly striated stem irregularly marked by rows of rootlets, both sides somewhat like Stigmaria irregularis Sigg. tending to show that these species may be merely casts of the internal mould of the species. It may however be a stem & fern attached to the bark of a Stigmaria. I suspect Stigmaria ficoides what is described in Goldenberg with varieties in Stigmaria anabathra and varieties at last in part being unable to see specific difference from the scars at least in most of them. In separating them from the size of the scars for example, I should take St 29 the stem preserved in iron with wound distinct & bulbat part as S. anabathra when its pith is very small compared to the stem and of the same size and form as figured in Gold. Foss. Flor. 3 tab 19. fig 1. & the same with St 65 which has small round convex scars in regular order and fine concentric lines but whose pith at the base of the trunk (which is round) is proportionally very small and marked upon its discovered surface by elongated ~~narrow~~ narrow irregular tubercles resembling the scars upon fig. 11 c. pl. 3 of Gold: which the author considers as ~~roots~~ roots going to the scars. Evidently the character of the thickness of the internal cylinder can not be taken as a character of species yet. It is possible that what I called Stigmaria unionata in Foss. Veg. p 370 is referable to this species. The specimens, some of these specimens, St 21 from Laurent's Jemmi. are covered with irregularly conglomerated rootlets which render their surface very rough and the scars invisible. To Stigmaria anabathra I refer specimens which have evident relation by scars & and undulation of surfaces &c to Corda's species & description.

D2 Stigmaria anabathra Corda Specimen with parallel lines diverging from the scars not forming ~~scars~~ scars.

D3 Stigmaria anabathra var. minor Gold. apparently lower stem of Stigmaria of a Stigmaria ficoides S. minor or S. monostigma

D4 Stigmaria anabathra or sp. nova. Scars more or less distant and somewhat irregularly in position small, round with a convex border surface covered with an epidermis of coal, irregularly marked lengthwise by elevated disconnected ridges varying in thickness. Much like the irregularities of surface of Bloedendron of which this may be another stem or floating stem.

D5 Stigmaria irregularis Sigg. radiciens Lyg. A number of specimens in the Museum represent these two species both sometimes upon the same specimen as in St 72. which has upon one side a smooth narrowly striate surface with irregular scars & rootlets and R radiciens & and on the other an irregularly deeply striate surface like that of a calamite but more irregular and also irregular scars as in Stigmaria irregularis as I do not see exactly what these specimens may represent. I put them all together with the number marked as above. See N 12 / 1452 b

D6 Stigmaria species propria Stem more or less regularly and distinctly striate lengthwise. Scars at a short distance from each others in about regular order, 7 to 8 mill. distant from each other in the direction of the spire, round cavities not quite 2 mill. broad, with a mere point at the bottom, sides narrow. The scar is distinctly distinct. many specimens representing perhaps two species as one specimen St 16 has radicans scars but is distinctly Stigmaria inornata Sigg Gen. Rept. Specimen St 15 from Manitoba has some likeness to it differing by scars more distant and apparently triangular. The specimen is somewhat obscure. St 15.

1. p. 451 c.

HALONIA TUBERCULATA? Brgt.

Pl. xxix, fig 1.

STEM about three inches broad, flattened by compression to one inch, bearing large, round, elevated tubercles, hollow in the middle, or funnel-shaped, with a round convex point or small mammilla in the center. The specimen is not only decorticated, but corroded by sulphuric acid, and nothing is seen of the cicatrices between the tubercles but irregular, undulate wrinkles, crossing each other without any definite direction. The hollow tubercles look like large cicatrices of *Stigmaria*.

As the tubercles of the species of *Halonia* have never been described *hollow* in the center, our plant is doubtfully referred to it. The deterioration of the surface has evidently not produced the cavities of the tubercles, for the internal surface is smooth, regularly inclined downwards, bearing at the bottom a discernible vascular scar, similar to that of a *Stigmaria*. This species may be a *Stigmaria*, though the cicatrices are at least double of those of *S. umbonata*, Lesqx.

From the Chester group, Pope county.

Sechonia Gopp. 2p. 451 c.

GENUS STIGMARIA, Brgt.

Ill. Geol. Rep., vol. ii, p. 447.

STIGMARIA ELLIPTICA, Sp. nov.

Pl. xxix, fig. 2.

STEM thick, half a foot broad, flattened to one inch; cicatrices placed in regular spiral quaternate order, elliptical, more or less elongated and proportionally narrow, with a central nearly round, small mammilla, marked in the middle by a vascular point. The specimen is covered with a thin coat of coaly matter, which has filled the scars, where it has an increased thickness, obliterating generally the mammillæ. These

are, however, distinguishable at the bottom of some cicatrices. Their size is proportionally small. The species is perhaps referable to some of the numerous varieties ascribed by authors to *Stigmaria ficoides*.

Prof. Goppert (*Flora des Ubergangsgebirges*, p. 246, pl. xxxii, fig. 3,) has published as *S. ficoides* var. *elliptica*, a specimen apparently decorticated, with oblong, elliptical and unequal cicatrices. These, by their irregularity of form, size and position, evidently belong to a species different from ours. The same author, in his *Gattungen Liv* .1, 2, pl. xv, fig. 49, shows part of the stem of a *Stigmaria ficoides*, whose cicatrices, taken from within the cylinder, are elliptical, while those of the surface are round. But in the specimen here figured we have the true cicatrices of the cortex. I do not think it advisable to enumerate and describe the different forms of *Stigmaria* as mere varieties of the same species. The vegetable remains described in the next genus, demonstrate that even the roots of plants of the Carboniferous age are distinguishable by peculiar forms and peculiar cicatrices. It is my belief, the genus *Stigmaria* does not represent tree roots, but floating stems, of which species of the genus *Sigillaria* constitute the flowers or fruit-bearing stems; the difference in the form, the size, and the relative position of the scars ought to be admitted as specific characters in the same manner as for the species of the genus *Sigillaria*.

Duquoin; shales over the main coal.

Stigmaria umbonata, Lesqx.

Geol. Rept. of Penn., p. 870.

I refer to this species remains of a *Stigmaria* found in abundance in the shales of the coal at Colchester, where the leaves are seen in connection with the stems. The cicatrices of the stems are of much larger size than those of *Stigmaria ficoides*, and the flattened leaves are twice as broad, measuring half an inch or more in diameter.

Genus STIGMARIOIDES, Lesqx.

The species referable to this genus, very variable in form, tuberculose, or globular, or cylindrical, are apparently tree roots or *rhizomas*. They have, as common characters, round,

8 Stigmaria latifolia Sp. nova Ined. Of this remarkable species there are three specimens
d°62 which show part of a stem of Stigmaria with round scars and leaves apparently
thick 1 1/2 to 2 centim wide, regularly and narrowly striate with equal lines and a thick
cicatrix. I have seen at Dr Guion's a slab that filled only with this species but could
obtain only two broken specimens d°63 & d°66. D°63 is a large leaf 1 cent wide
with irregularly undulating borders narrowed to one side, thinly striated with perforated
specimens by what appears to be scars of Stigmaria and in which I do not know
what to do of. It may be a cordaite for it is hardly possible to admit there is a
leaf of Stigmaria

9. Stigmaria triangularis Sp. propria. A nodule with part of a stem, smooth with scars in regular order 3 millim. wide, at the base which is joined to the bottom remains of a leaf round pointed upward, nearly triangular in outline base flat, about 6 millim wide. The stem is 3 cent wide. Nothing more can be seen from the specimen d°79. May be some form of Stigmaria Ansalthra with rather sigillarioider radicans Lyell (this report n° 31 [illegible] 4 upwards)

10 = Stigmaria species. A piece of petrified (but stained of iron) stem showing in the middle a large meduller flattened canal, the central part undistinct the borders marked by rays diverging from the centre to the borders. The surface on one side appears as covered with leaves of Stigmaria.

11. Stigmaria with leaves. d°31 a fine specimen showing part of stem of Stigmaria covered, at least from the form of the scars, with long straight apparently rigid leaves 4 millim wide with strong medial nerve and borders somewhat macerated.

12. Stigmaria leaves or wattles of Calamites. A large number of wattles or leaves regularly placed around a stem? broken, contiguous to each others narrowly striate, sometimes slightly undulated just in the length, without medial nerve and appearing like wattles of calamites coming out around a stem like the leaves of Calamites. These leaves vary in breadth from 3 millim to two centim. and are here and there marked as by perforation of wattle with irregular scars. These leaves are much like those of Sigillaria irregularis and this species I think is also referable to leaves of Calamites.

~~13 Stigmaria ficoides Sigillaria Lyell. Thirteenth~~

(13) Stigmaria ficoides I. ex Bronguiart in Mem t Grand Eury p. 17 (1).

14 Stigmaria species. Alaya trunk, standing in the museum of Brunswick New Jersey represents a Stigmaria — Sigillaria, with scars of Stigmaria and leaves coming out of them and descending down and along the trunk forming in appearence the ribs of a Sigillaria. This Stigmaria trunk show that Stigmaria are not wats as the trunk is large, standing and covered with wattles or rather leaves appressed against the trunk and nerly parallel between them.

15 Stigmaria species (rugosa nondivaricata) Specimen d°1605 from Raurt gap. Surface rugose polished covered with wrinkles lengthwise. Scars nearly in regular quincunx small scarcely 2 mill. in diameter with a small central vascular point, distant, one cm one half centimeter in lateral direction and 3 in vertical direction and 3 in the vertical. There is nothing figured like this species which by its small rugose polished surface and its distant small scars present an appearence totally different from that of all other forms. I have seen the same in Nebula at S. S Strong without any difference whatever. (1876)

1. Stigmaria minuta Lesq. The sp. Pa. 29. & Pc 31, represent this species which appears to be the same as S. exigua Dawson. Foss. pl. Lab. & Dev. fig. 30. The specimens are obscure or badly covered with the waters of coal, but the outlines are readily distinguishable, Pa 29 represents very small branches not thicker than half a centimeter, with scars regularly placed two mill distant from center to center in all the directions and then quincuncially disposed they appear round but are rather somewhat oval or o, being filled with coal the real shape is not exactly seen. The branches fig 31 are larger, two cent. or more, their scars proportionately larger and distant, the disposition the same. In this the scars are distinctly like those of my fig. 2 of Pl. XVI, and therefore I consider them fragments identical. The specimens come from the Serpentine below Pottsville.

2 Stigmaria ficoides. One specimen S.m. 45 a ½ part of a cylinder 7½ cent broad slightly flattened with oval scars in exact quincunxes (o) with the pith on the lower side and out of the woody axis as of the stem like this, the whole here formed into sandstone.

3 Stigmaria radicans Lx. I can not consider this species as a good one I find however in all the collections, especially in that of Lacoe. pres. N.° 549 leaves apparently of Cordaites, smooth surface closely striated rather lined like Cordaites borassifolius crossed & perforated by small openings generally oval but irregular in outline, about 5 mill long 2 & 3 mill. wide often bearing scars or print of or of a leaf of Stigmaria emerging from it. This appearance is remarked upon shales, of a coarse surface and those prints may be mere lacerations of the bark caused by the unequalities of the surface or from the thread of organisms underneath.

Stigmariopsides Lyg.

1. Stigmariopsides lineatus Lyg. From Arkansas we have a fine specimen 128 which is exactly like the specimen figured in the rep. P 31, fig 2. very only larger. The primary axis is 15 millim wide marked by round scars and a central point just like small scars of Stigmaria. The branches 4 to 5 millim either go out of the stem in right angle or descend obliquely as it. These, like the primary axis are marked by the same kind of scars more or less irregular in position. One of these branches has 6 or 7 scars about upon the same line, varying in distance from 5 to 10 millim, no larger than one millim wide with a distinct central rounded scar or point. The branches however have no trace of medial nerve. They are small or like the central axis irregularly, narrowly and obscurely striate. Specimen St 41 appears to represent the same species, one branch only whose divisions are narrower, subdividing in linear slit narrower horizontal branches scarcely one millim wide like Pinnularia. The principal axis has the same kind of scar. St 81 is still a better specimen with branchlets hyperum. flat, pitform. see 1a below

2 Stigmariopsides Brongt. Lyg. Same as described and figured Ill's Geol Rep 4 vol 2. P. 448 Pl. 39, Fig. 9. it has St 32 St 38 has the scars smaller and the impressions flat, not umbilicate. May be a different species. But form of the scars is the same.

3. Stigmariopsides villosus Lyg. This rep. p. 454 Pl 31 fig 1. One of our specimens is that figured as above. Another of the same has also a branch of Decopteris villosa with it.

4 Stigmariopsides tuberosus Lyg. This rep. P 453 Pl. 29 fig 5. One specimen shows the tubercle and a still longer part of stem joined to it. The tubercle is punctulate with round convex papillae. The axis appears to be a round rugose stem coarsely striate Centrifugal.

5 Stigmariopsides affinis Lyg. The specimen figured St 41 is in the Museum We do not have any other and it is exactly copied and described P 455 pl. 27 fig 9.

1a. St 41. a specimen from Morris that represent a true stigmaria? Anabathra? with nearly irregularly costate longitudinal costa or ridges, narrow parallel undulating slightly 1 centimet distant like the small round elevated tubercles scarcely more than one millim. in diameter and with a deep central point in the middle — This is the same as described p. 451 pl. 2 as Stigmaria Anabathra? See the specimen in my drawer. Large specimens of a species like this which I have named to Prof Lyg as S. microstigma sp. nov. are apparently also referable to this. The scars are in regular spiral order small, about 2 millim. broad, 3 centimeters distant with a ring and central deep point upon almost surface of the stem. manilla

6 [illegible] Stigmariopsides [illegible] Pl. 75 a [illegible] Stigmaria [illegible] Stigmariopsides like those of Stigmaria [illegible] with other species [illegible] with those of Stigmariopsides radiating indicating that both these organisms Stigmariopsides and Stigmaria are of the same [illegible]

small scars of rootlets, generally placed without symmetrical order, and without a central vascular point.

The affinity of this genus with the former appears at first very close; but we have here species, evidently roots, some of them rhizomas of ferns, marked by irregularly placed scars, which cannot be united to a genus which, even if it should represent a kind of roots, is far different in its essential characters, viz: the regularity of position and the form of the scars. The name of *Rhizolites*, P. Braun., a genus enumerated but not described by Unger, might be, therefore, appropriate if, per contra, the species had not a near relation to those of the former genus, by the form of the cicatrices and of the leaves.

All these species appear to have been of a soft substance, and without exception, have been found preserved in nodules.

STIGMARIOIDES TRUNCATUS, Sp. nov.

Pl. xxix, fig. 4.

A cylindrical root, about one inch in diameter, with a smooth surface, marked with small round cicatrices, without order of position. These cicatrices vary much in size, and are evidently scars, left at the base of short, horizontal, flat rootlets, scarcely one line broad, without mark of a vascular line. The vascular point is also absent in the middle of the scars, or marked by a mere cavity.

This species resembles the one published in vol. ii of this Report, p. 448, pl. xxxix, fig. 9, under the name of *Stigmaria Evenii*, which has the surface undulately ribbed and broader scars, and is also referable to this new genus.

Found at Mazon creek, in concretions of argillaceous iron ore.

STIGMARIOIDES TUBEROSUS, Sp. nov.

Pl. xxix, fig. 5.

I do not know any vegetable organ to which these peculiar remains could be compared. The specimen figured represents a nearly round or square oval tubercle, with a convex surface covered with small round points irregularly placed, resembling scars of hairs or scales. In its upper part it is

strangulated or narrowed into a broad, tubulous, plaited leaf? or stem? resembling a large leaf of *Stigmaria*. It may indicate the first development of a rootstock, or represent a tubercle like those found at the end of the leaves of *Stigmaria*. It is marked in its upper part by a large round mammillate cicatrice, resembling also that of a *Stigmaria*. Its peculiar form cannot be considered as some casual deformation, as it is not only distinct in the middle of a concretion, but we have two specimens of exactly the same conformation. The one which is not figured has the leaf longer, and the tuberule slightly smaller.

From Mazon creek.

Stigmarioides villosus, Sp. nov.

Pl. xxxi, fig. 1.

The form of this kind of tubercle is about the same as that of the former species, square, round in outline, appearing to have been cylindrical or inflated. Its surface is marked by two kinds of cicatrices: the one, numerous, punctiform, inflated, placed close to each other in irregular spiral order; the other much larger, auricular, with a mammilla and central point. The first look like scars of scales, the others like those of rootlets. This tubercle is, as seen on the figure, in close connection with a branch of *Pecopteris villosa*, Brgt.

But the union of both parts is not evident, for at its base the rachis is straight, and not curved to the root, by which the juxtaposition may be casual. Nevertheless the verrucose surface of the tubercle resemble so much that of the stem of the *Pecopteris villosa*, that it is scarcely hazardous to consider it as part of the rhizoma of this fern, and the same familiar juxtaposition of the same species of fern and the tubercle is marked upon the three specimens, which are all that have been procured as yet of this peculiar form.

Found at Mazon creek, in concretions of argillaceous iron ore.

Dalecpteris relation of this genus. As seen from the figs in my plate 50, the Dal. can not be considered into the Neuropteridea on account of its fructification. This has some remarkable analogy to that of Staphylopteris asterocides, while its nervation, straight veins is comparable to that of Tryphillopteris a copied same plat from Meett. which is also very closely allied to Dalmeyeria by its nervation and the division of its leaflets. Of the species which I refer to the Genus Dal. Bothrenae (name should be changed as there is already that is not the species name of Dal. Gaepperti) show how greatly variable are the leaflets which represent the species. My Dal obtusa (Woezgeathia) copied from Gein: Dyas. should be regarded as a species Schimper compares or unites it to Dal. Hybernica from which it evidently differs by the enlarged lobes, generally undulate at their but never dinate or cut nodate as in Dal. Hybernica as it is shown by Schimper in his splendid plate 36. and for more enlarged at their tips. My fig 7 is copied from a sketch of a large branch sent to me by Rev. of Montana, Penn. Fig 5 of same plat, my Dal. minor is positively the same as that figured Pl. 50 with fruit. The species very very much for the form of the leaflets and the thickness of the rachis. The rachis is quite broad & flattened, but its subdivision are either too narrow branches as seen in one of my figures a few the all were as seen for another figure where leaflets are much smaller. This one, I hope compare to Dal. Roemeri Gaepp. and may be it is right. Count if so, my species has the predominance being yielded that is 55 while Gaepperti is to 50. The leaflets of both species are the same but there is a difference in the character of the rachis which is deeply wrinkled crosswise, a character remarked in Dal. Alleghaniensis of Meett. fig 9. pl. 49, while Dal. Lesleyi Andrews fig 8. 8a is positively the same my Dal. minor fig 7 pl. 50. The simple leaflet 697. from the same formation as 695 and from the same place but both from another locality as Dal. minor may be the only fragment referable to Dal. Hybernica, while spec. 695 is Dal. Obtusa, as seen from the enlarging tips of the leaflets. The fruit are distinctly marked as seen upon the specimen a very good one with the sporanges quite distinct. They appear either united but both then together one some of them born upon a short pedicel, but the lacinia are all linear obtusely pointed and when old appear separated from the base and born upon a short pedicel. They are concave & convex, thick, but without any trace of veins or thin as marked upon Schimpers fig. enlarged and they are generally born upon the upper surface of the pedicels. They are often when old, either hanging or pressed downward as in the enlarged fig. 2c. A specimen 696 represent much branches of fructification with there leaves. In this all the bundle of sporanges or many sporanges are borne erect upon the upper somewhat flattened surface of the rachis (branches) curved upward like this figs. Also curving of some of the branches

gives to them an appearence of circinate venation. But that is a mere appearence for a few only of the lower branches have this curvature the upper shorter branches of the raceme are nearly horizontal oblique to the main rachis and straight. In specimen 695 a form intermediate between Dal. nervosa & Dal. obtusa, the pinnae or leaflets are semitorted a character indicated by thumper for this Dioscoreaceae but the added distalata, a character which is not remarked on the fossil species. In the small specimen 703 referable to Dalbergiites nervosa the pinnae leaflets are concave and appear at the base slightly enlarged and semi embracing Figs. 5. 6. & 7. of pl. 49 show the mode of attachement of the pinnae or leaflets just as it is marked upon the specimen, the leaflets appear sometimes as decurrent by the application of the upper border along the rachis. It is however evident that these pinnae are born along the border of the rachis which is sometimes flat and in Dal. nervosa marked per and then by a narrow depression in the middle. In spec. 698 a. Jean we distinctly some of the pinnules semitruncate at the base which is apparently made by compression at the base in direction perpendicular to the natural or normal one. If so the base should have been seen embracing or sagittate the rachis. The leaflet 697. which is figured shows the base as it seems to be really when in contact to the rachis; the base is slightly emarginate or retuse as in the leaflet of Pl. 49 fig. 4. Some of the specimens of Dal. nervosa one among others given to me by M. Rosencrantz and which has no label shows well the position of the leaflets as they are figured Pl 49 fig 5 & 6. the rachis being generally marked in the middle by a deep line (I have figured it) bordered by or rather joined (the border) by the base of the leaflets which sometimes as said above seems decurrent but is not;

STIGMARIOIDES LINEARIS, Sp. nov.

Pl. xxxi, fig. 2.

A long, linear, cylindrical root, half an inch thick, slightly tapering downwards, obtuse at the base or broken, bearing narrow linear leaves or radicles one line broad, without medial nerve, leaving at their point of attachment small round cicatrices, placed without order and without visible central point. The rootlets or the first divisions of the root are also marked with round scars, fig. 2*a*, indicating a subdivision similar to that which is sometimes observable on leaves of *Stigmaria*.

Found at Mazon creek, in concretions.

STIGMARIOIDES AFFINIS, Sp. nov.

Pl. xxvii, fig. 9.

THIS species, represented by two specimens, appears intermediate between *S. tuberosus* and the following. It has a short cylindrical base, divided like a root in branches, tending obliquely downwards and diminishing to a point. This part, about one inch long, is covered with horizontal, half an inch long linear narrow scales, or by their scars, in the form of sharply elevated points. From its slightly strangulated *collum*, or top, it abruptly passes into a broad linear flat leaf or blade, marked on each side by two obsolete lines resembling nerves. Its surface is equally marked with distant points, basilar scars of scales, a few of which are still seen on its borders. These borders are straight, sharp, well defined, like those of a leaf of *Lepidodendron*, and the surface is minutely and irregularly striate lengthwise.

Found in the concretions of Mazon creek; by Mr. Jos. Even.

Stigmarioides selago, Sp. nov.

Pl. xxxi, fig. 3 and 3*b*.

An apparently cylindrical branch or root, whose essential axis, about half an inch thick, is tapering downwards, dichotomously forking, covered with long, narrow, linear hairs or scales (fig. 3*b* enlarged), bearing from the end of the divisions long, hard, quadrangular, tubular, thick, naked leaves?, with a thick, medial, vascular vein, and a narrowly striated surface.

These leaves or roots are similar in form to those of *Lepidophloios*, but much longer. The figure exactly represents the specimen, which is finely preserved in the middle of a concretion. But the union of these hard, smooth, cylindrical leaves with a stem or root entirely covered with hairs, and from the point of alternate divisions, is so peculiar, that nothing among fossil or living vegetables, that I know, can be compared to it. It is uncertain whether these hard leaves represent rootlets of some kind, or root-stalks or leaves, and possibly the specimen may be figured the wrong way. By its straight, horizontal, narrow, linear hairs, the part of the stem which bears them resembles the species published in vol. ii, of this Report, p. 446, pl. xli, fig. 3, under the name of *Selaginites uncinnatus* (1).

In a concretion from Mazon creek.

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(1) Under the name of *Rhizomopteris*, Prof. Schimper has published, loc. cit., p 699, two species formerly referred to *Selaginites*, one of them, *S. uncinnatus*, Lesqx., Ill. Geol. Rep., p. 446, pl. xli, fig. 3, which he considers as rhizomas of ferns. These two last species of ours should be referred to the same genera. *Rhizomopteris* (*Selaginites*) *Krdmanni*, Germ., has been found in the concretions of Mazon creek in well preserved specimens.

Rhizolithes.

1 Rhizolithes (cinnularia) fucoides Dyer. Geol. Rep. 9th mo. 4 1874 p 19. This species has many good specimens, two of which has the principal axis 15 mill. wide. The form and mode of branching and division is like Rhizomorpha but the branches and branchlets do not bear any scars and the borders appear always as more or less inflated. This a root of common occurrence in the coal measures. The figure of the Rep.t is right. but the branches of the first division are figured from the main axis and the branchlets in right angle only for a few of the second division. The specimen figured in Penn.a Rep. represents a branch of first division.

2 Rhizolites (Zanichellioides?) (or another name) spec. prop. nov. Primary axis never wider than the divisions, pinnately divided in alternate branches or leaves, flat, nervures 1 to 1½ mill.m wide, nerved in the middle, their branches or secondary divisions alternated at the point of junction. No trace of scars. The species looks somewhat like a Zanichellia in its mode of division. It is thin apparently being covered by a reddish pellicle which separates easily. The specimen represent probably a mere branch of a larger species.

3 Rhizolithes capillaceus Dl & H. Under this name I have put together a number of specimens which may represent some species of Rootlets but which can not be easily characterized.

4 Rhizolithes palmatifidus Dyer. Acad. Report. p 313 pl. 5 fig 4. Specimen type. Dr. 11.

256c

1 (Stigmatocanna Wollmanniana. Gopp. Fa. 33. A smooth large branch covered with the thick yellowish bark whose surface is smooth but distinctly striated or marked by distinct though very shallow furrows, and by three knots upraised where the bark is destroyed and where form is then undistinct. Thing comparable to Goppert's species which is from the transition formation of Germany. Is not positively identifiable.

1. Megastrotum M'Coyi Sdgw. A splendid specimen though bearing only one scar was obtained for the Museum from Dr. Hand of Morris (20.5.71). It shows more distinctly the form of the scar than the one published in the 2nd vol of this report. The outline of the scar is round oval 3 inches long or a little more by 3 inches broad. The outer ring ¼ an inch broad slightly narrowed downwards passes upwards and downwards into the lingula or medial blades which separates the two lobes. All the surface of the scar border, lobes &c are covered with well marked points regularly placed. The scar has here apparently its normal form, the scar being isolated and not crowded and compressed at both ends, there is three inches above and below the scar where the stem is visible without any other trace of scar. (1.6.71). Morris. Hale.

2. [illegible] Specimen No 587.9 Xacus [illegible]

1 Genus Caulopteris. Grand'Eury (Rept mem. p. 6) thinks that the Protopteris can not be separated from the Caulopteris. But that a special group should be established as Dyctiopteris with Caul. macrodiscus and a few others.

STEMS OF FERN TREES.

Genus CAULOPTERIS, Ll. and Hutt.

Ill. Geol. Rep., vol. ii, p. 458.

Caulopteris obtecta, Sp. nov.

Pl. xxviii, fig. 1 to 4.

Stems of small size, varying in thickness from four to six inches, entirely covered with long, linear, cylindrical, ærial rootlets, attached to it without relative order of position, bearing at their base an elongated oval scar. Branch scars distant, oval obtuse at both ends, two to three inches long, one to one and a-half inches broad, marked lengthwise by broad striæ, or marks of ærial roots. The rootlets are regularly cylindrical, one foot long or more, apparently tubulose, without trace of a medial vascular line, closely appressed to each other, and upon each other in the same downward direction, and so entirely covering the stem that their cicatrices are rarely distinguishable. The branch scars are distant, as seen figs. 1 and 2, which show both sides of the same part of a stem, and indicate the relative position of the scars. The order of position appears to be as one to four, but is obscured by the flattening of the stem, whose thickness is, by compression, reduced to one inch at the upper part, and to two inches at the lower part. A branch scar and part of stem are figured, natural size, fig. 3. The distance between these branch scars is so great, especially toward the base of the stem, that a number of specimens, some as large as one foot square, were collected at Colchester, and, though closely scrutinized, did not show any trace of them.

These specimens are generally flattened to less than one inch in thickness, as if the stem had been of a soft texture. Generally the coat of superposed radicles is transformed into a pellicle of coal and these are marked on their surface by very thin parallel striæ, perceptible only with a strong glass. This coating of radicles upon the stem of a fern has nothing peculiar in it, as some fern trees of our time show the same kind of conformation. One species, *Polypodium armatum*, Swartz, from Brazil, is figured in Sternberg's Vers., vol. i, pl. E. But from the Coal Measures we have as yet nothing analagous to this species.

The beautiful stem represented, figs. 1 and 2, is from the shale of Morris, and belongs to Mr. Jos. Even, who kindly furnished me with splendid photographs of it.

Caulopteris acantophora, Sp. nov.

Pl. xxvi, fig. 3 and 4.

The species is represented by numerous specimens, some of them of large size, all of the same appearance. Their surface, either naked or coated with a pellicle of thin coaly matter, is marked by irregular elevated points, placed without regular order, evidently the basilar scars of spines, with which the branches or stems were covered. On the large specimens no trace of branch scars was discernible, but the oval line, marked fig. 3, running parallel to a broad depression seen at the corner of the figure. It is a kind of deep convexity in the shale, with smooth, irregular borders, resembling rather the impression left by the sides of a nodule than a branch scar.

Fig. 4 represents a branch of this species, apparently at least, for it has the same kind of cicatrices exactly on the surface, and still bears on its borders some of the hooked spines by which they are produced. The branch is attenuated into a conical point of attachment which does not resemble that of a branch of *Caulopteris*, and is also marked in the middle by a scar which, per contra, has the form of the branch scars of a fern. These specimens, all flattened, are therefore probably only referable to this genus.

It abounds, like the former species, at Colchester, and is also found at Morris.

1. Caulopteris acantophora Dgn. Of this species a specimen was obtained from G. S. Armstrong of Moores (20.5.71) on nodules from Mazon creek, which show scar of branches and seems to indicate it as referable to some new genus. These scars are small not more than one forth of an inch long, oval - elongate, about 1/4 of an inch broad surrounded by a slightly upraised rim not quite 1/4 of an inch broad, smooth or without trace of point. They are placed at vertical distance of about one inch either single or approached by two or three showing an irregular alternate position. The size of these scars would agree very well with the narrow base of the branch figured Pl XXVI fig 4. x same specimen at Strops.

2. Thiz Caulopteris crassa sp. nov. Specim. Di 56 + Di 1011 upon nodules from Mazon creek. I had at first considered the species as Selaginites Erdmanni Gein. from Geinitz fig. Tab 1. fig 5. But from the mode of unfolding the branches in spiral it is probable that this species is regular and that they represent merely opening stems or rhizoma of Ferns. The stem is broad 2½ decim at the base, tightly narrowed upward. 45 decim long bearing three branches curving in spiral downward when the stem is like the top of one fern. It is covered all over with dense straight, or arched linear sharp pointed hairs 1/2 mill. long which curve to the same side as the branches. These branches are scattered and thought smaller could perhaps represent the species described here pl 417 pl 18/1 a Hymenophyllites Stroyi. Both the specimen are much alike and can be compared neither with Lycopodites Erdmanni as figured by Geinitz N 1 fig 5 nor to the same species as figured by the author German Letter Selaginites N 2 6.

1b Caulopteris? accentophora Dgn. The surface is generally covered by a thin pearl like cuticle and then thin striated. The point marking point of attachment of the spines are immersed distant but much less so than in Hymenophyllites Erdmanni. They are also smaller and most bordered by a rim. Referable to the Genus Stemmatopteris.

3. Stemmatopteris obtecta Dgn. Nothing to add to the description of this species as given p. 457

4 Stemmatopteris Cistii Bgt. A good specimen in coll corresponding with description and figure of Bronguiart pl 140 fig 2 Jon. fl. #1. see 2a below

5 Stemmatopteris elongata Sp. nov. Specimen S. 44 caule cylindrico subcompressa medium center broad on the widest or flattened part, 5½ cent. on the other 5½ marked by elliptical scars 10½ cent. long only 2½ cent. wide, bluntly pointed at both ends marked in the middle by an oval internal scar as in S. Cistii but narrower and placed higher up within the general scar. This species may be a form of S. Cistii But the surface of the stem is smooth not even by radicles and the scars are longer and proportionally narrower See pl 39.

6 Stemmatopteris punctata Dgn. Gein. Carb. Rep. pl 13 fig 1. The specimen S 40. has the intervals of the scars verrucose, the warts being thick close to each other and pitted at the point. This specie is probably referable to S. subligera Bgt. whose cicatrices appear to be about of the same form. They are however narrower both in the specimen figured in Gein. Rept. and in the specimen of the museum which is not very good. It is better to preserve the species considering it as closely related to the European one.

7. Stemmatopteris ciliata n. sp. nova? Specimen S. 60. Representing a single scar perfectly well preserved but detached from the stem and without connection with any part of it. Scar ovate, enlarged downward 6½ cent. long 4 cent broad in the broadest part, surrounded by a fringe of short thick linear lanceolate pointed & curved hairs or scales. The margin is more than one cent. broad, the internal scar oval closed at the lower part, curved in horseshoe upward as see in figure 3 pag 529. Surface of the scar smoth

40 Stemmatopteris Cistii. The coll. of Lafayette college has a specimen with scars 2½ cent long 3 cent. broad internal scar at top. 1½ cent broad see fig. 8 p. 531.

1. Rachis or stem of fern. Stem. 1.24 to 1.25 at a distance of about 4 cent. in articulations one slightly oblique, mostly the stem which bears beside, other upon the articulations or above them what appears deep scars of the base of the petiole. They are about semicircular in form ( ) about of this size. 1.25 has only the oblique articulations.

Another stem, 1.14. is a nodule of two centimeters wide and scarcely half as broad ~~placed without apparent order and~~ without any cicatrice in the middle but an undistinct point. The scars are horizontally about 1/2 decim. distant and three in vertically. The order of disposition is marked. one of the cicatrices being a little above the other or in an oblique position. and vertically in a slightly marked spiral order. This may be referable to thyrsanica or rigiliana or may be a small broad stem of them?

1.15 is a nodum, irregularly shaped stem bearing some verrucose ( ) scars of this size and form which appears to be some sphenica under a thin cortex. When stems are in the drawer after the Megaphyllum &c.

2 Stemmatopteris Mansfieldi spec. nov. mihi. The specimen No 92 represents a fragment 20 c. long. 12 cent broad with large oral proudly margins of scars truncate or in the form shown at the top. These scars are placed in quincounce close to each other, two centimeters broad and nearly 1 cent long without the borders which are more than one cent broad. ~~each~~ the one no more than one cent. one cent distance laterally and surrounded by the ~~totallened~~ remains of rootlets which pass between and above the scars ~~growing by~~ growing by their direction that they are the impressions of adventive roots as remarked by Schimper in Pleg. Vol. p. 470. This fine species has some affinity with S. Jacki Listii, Bright & L. pelligera. from the first it differs by the more exactly oral scars close to each other pronotionally broader marked at the top by the incurved horns left from the regular recession of the central pad and the direction of the rootlets or of them impressions which not merely pass between the scars but surrounded them. See p 459 b. (1).

3 Caulopteris. Gifford. Specimen from M. Wm Gifford Alter. Ill. Stem 17 cent. broad, flattened to about 5 cent. thickness in the middle marked around by 6 rows of alternat oral deep scars. 7 cent. long 3 cent. broad in the middle, obtuse and forming at the ends marked in the length by deep vertical cortex three millim. broad, more or less irregular. The scars marked smooth upon the figure have had their ~~fibrate~~ coating destroyed. They are deep concave irregularly obscurely lined and roughs showing the nubilence of the woody fibre. The bark between the scars is thick about one millimeter rough verrucose, the warts generally directed in the length and oval. This species has an analogy with C. Phillipsii. L. & Hutt. Vol 2 N. 141 differing much however by the more elongated scars orbicular more regularly and distinctly marked in the length and the bark rough verrucose punctulate, not smooth. The external structure is composed of linear white cellulose cortex coating ~~intersected~~ by black ones as marked in the figure. Specimen returned to the owner. It is comparable also to C. macrodiscus Pryt which has the cicatrices longer and narrower.

1 Coulopteris Mansfeldi sp. nov. Herb. Roy. Mansf. spec. 929 P. fig. 2, Surface broadly striate by (apparently) closely appressed rootlets covering the stem and passing around the cicatrices and not merely between them. Cicatrices, large, 6 p. cent. in diam. long 3½ p. cent. broad, including the surrounding borders or double ring which includes the internal or secondary disk which is 3 p. cent. long 2 cent. broad. Cicatrices, exactly oval, the internal ones somewhat more enlarged at the lower end and somewhat marginal at the upper part by the borders or margo curving inside in the form of a horse shoe, a form however which is somewhat obscure. The cicatrices close, in quincuncial order or in oblique direction and alternate, their distance varying lengthwise from two to three centimeters. The nucleus or external cicatrice is convex, and rugose, the borders of the scar generally smooth and flat is often partly covered by the flattened rootlets either at the upper part or on the sides. On the surface when exposed and it is partially under the cicatrix is punctulate. The form is related to C. (Sigillaria) pelligera Bgt. from which it differs by the form of the scars more exactly oval, the central nucleus smaller the direction of the rootlets which have evidently covered the stem while the leaves were still attached to it, as they turn around them in passing down the stem. In the corticated specimen of Brongniart they are parallel and vertical. This however could not be considered as a difference worth mentioning, for what Brongniart considers as the decorticated state may be the corticated without the rootlets which may have been attached only to the lower part of the stem while above the scars might have been free of them and open. The distance between the cicatrices is about the same in these and the Europe species.

2 Coulopteris (Sigillaria) pelligera Bgt. Prod. Syn. p. 383 & Descr. Foss. Dépt. Vosges p. 150 cent long. with Gaillardot Potier Flore Foss. Terr. Houill. Vosges p. 150 cent long. His flattened rootlets appear 2 cent in diameter. The scars are known 1 cm. distant, 2½ cent. apart in the vertical direction, 1 cm. being marginal at the upper part. Broad mammiform. The scar is oval including the ring 4 - 5 cent broad and 6 cent long. 5 to 6 cent. apart vertically, 3 to 4 cent apart. In the centre between the scars the rootlets, mammiform, deeply undulate broad striæ, irregular in width, which is more regular in the interval between the scars. The figure 6 p. 535 in a different rather point of view, the scars are only 3 cent long and 2 cent broad with a long [illegible] of scars and covered with striæ continuous to those of the vertical intervals. See fig. p. 533 b. See p. 459 & d.

3 Coulopteris Cisti Bgt. Descr. N. 583. Dépt. Vosges. Imperfect specimen with narrowly oval scars. 6½ cent long 22 millim broad. Distant in vertical lines 11 cent. in horizontal about 4½ p. narrowed at both ends. The intervals surrounded by vertical somewhat undulated striæ. Brongniart. This species may have some analogy with C. Mansfeldi. See fig. of 583 & 584. Opposite the species n. 533 fig. 1. See 459 a (3).

4 Coulopteris [illegible] Bgt. Prod. 385 Descr. Dépt. Vosges. Of this species as at present I consider the scar described 458 (B) as the same, there is a large specimen with 7 scars in 10 cm. These are distant, hemispherical and form as in fig. 4 p. 535. The surface between the scars 10 to 15 cent. in vertical 5 to 6 in horizontal measure is covered with striæ or rows of scales oval, terminated with a small point. [illegible] which render the surface coarsely wrinkled. may be the same that is [illegible] figured [illegible] there. [illegible]

459a

D

[illegible]

D 3 Caulopteris Cisti Brgt. Another specimen of Lacoe N° 712. Has the bolsters a general scars much smaller 4 cent long; 11 millim broad in the median oval with a distinct horseshoe formed line as in the sketch of the border vertical distance 6 cent. horizontal 3 c/m with undulate thick roughly marked between and a mouth tail below terminating in point at the top of the lower scars.

D 4 Caulopteris [illegible] Brgt. Lacoe Spec. N° 713. Bolsters nearly round broadly oval 3 ½ cent long 27 mill broad vertically and horizontally equally distant 6-7 mill. Surface of the scars and vertical distance between them narrowly deeply irregularly striate by wavy thin horizontal spaces smooth by covering of a waxy thick epidermis ¼ of a mill. thick which is easily removed and shows then the whole surface, scars and interval, marked by the longitudinal slightly undulate, irregular striae; there are thousands narrow like thick filaments nearly half a millim thick. The form of the leaf scars horseshoe shaped are seen obscurely through the filament, placed forward the upper part of the scars. see fig. 14 of t 546

CAULOPTERIS INTERMEDIA, Sp. nov.

CICATRICES elliptical, elongated, three inches long, a little more than one inch broad, narrowed downwards into a broad cauda, pointed at the top, irregularly ribbed or sulcate, with a central, elongated scar, and without definite marginal disc. Surface between the cicatrices apparently smooth, marked by points or mammillæ about one-eighth of an inch broad, half an inch distant, placed in an irregular spiral order. The space between the cicatrices is horizontally one and a-half inches, and two inches in the direction of the spiral.

This species is known to me only by a sketch lately communicated by the State Geologist, and received after the preparation of the descriptive part of this Report, and the engraving of the plates. It appears to be intermediate between *Sigillaria Marodiscus*, Brgt., and *Sigillaria Cistii*, of the same author. The form of the cicatrices is about the same size as in the first of these species, but they are disconnected at the base, placed in true spiral order, and at some distance from each other, as in the last species. It is a true *Caulopteris*, according to Schimper's definition of the genus, while most of our species of *Caulopteris*, viz., those whose internal cicatrices are surrounded by a flattened border generally opening inwards in the form of a horse shoe, are referable to the genus *Stemmatopteris*, of Corda.

In sandstone, over coal No. 3, one mile south of Rushville, Ill.

FRUITS OR NUTLETS.

Genus TRIGONOCARPUM, Brgt.

Ill. Geol. Rep., vol. ii, p. 460.

Trigonocarpum Nœggerathii, Ll. and Hutt.

Pl. xxxi, fig. 16.

This fine fruit is cut in the middle by a section of a nodule which only represents its internal part and structure. As the outside form is not known, and the internal disposition is slightly different from that of the fruit published by Lindley and Hutton, vol. ii, pl. 142, our species is doubtfully considered as identical with the European one. This fruit has three distinct walls or envelopes. The external one, more than one line thick, looks like a fleshy, soft exocarp, the part which it occupies being of the same compound as that of the stone, merely changed in color and intermixed with small pyrites. Its form is exactly ovate-pointed, slightly emarginate at the point. The second wall, transformed into crystallized iron, is irregular in thickness, ascends, first as high as the point of the central ~~rootlet,~~ where it divides, one part uniting both borders, the other ascending near to the point where it is joined in an obtuse top. The third envelope, as thick as the first, ascends to the point c, and is a compound of a black substance mixed with fibrous tissue. The internal nut is of a spongious compound like the third envelope, but is marked with more numerous, yellowish filaments, directed longitudinally, and irregularly broken across. Its point seems ascending into the first wall of the whole fruit. The English authors compare the fruit to that of a palm, and recognize in the middle of it, the place of the embryo, a depression which is not seen in ours.

Found in a concretion of Mazon creek, by Mr. Jos. Even, to whom the specimen belongs.

Trigonocarpum olivæformis, Ll. and Hutt.

Foss. Fl. 3 t. 222, fig. 1 and 3.

Collected from the sandstone of Eugene, Ind., by Mr. John Collett.

1. Trigonocarpus parkinsoni Brgt. Hist. Geol. Rep.: 2 p. 460 pl 146 fig 3. Specimens of T. noeggerathi are represented in Bindley's descriptions pl. 21 & 22. which have some relation of form with my species especially tab 21 fig 6. but all these are abruptly pointed or otherwise while our species as seen from specimen T. 11 is taper pointed see figure 13 p. 529. which completes by the point that of the Hist. report which only shows the upper part. the part marked in a is shell near the base, the remnant of a shelly pericarpe surrounding the fruit. By destroying the fruit the internal structure could be seen in parts. On other specimens, Ca 29. 26 & 41 the shelly covering is evidently marked by a thinn coat of coal and flattened borders.

2. Trigonocarpus noeggerathi Brgt. I refer to this species without being perfectly certain of identity the following forms comparing them to figures in Bindley's &c. &c. except where otherwise is marked. Specimen Ca 4 a flattened oval fruit 22 mill. broad 4 centim. long irregularly striated in the length and very obtuse, nearly truncate at both ends. It corresponds with Bindley fig. 1. Tab. 21. p. 6. Coal, obtusely pointed at both ends slightly ovate, marked with three main ribs somewhat as in fig 3 same plate, but more pointed not truncate at base. (14 more oval lanceolat pointed specimens which are scarcely referable to this species as figured. B. tab 23 fig 12. as this is T. schutzianus) T 78 just like some of the figures of tab 22. p. 15 6., Ca 55 referable perhaps to Carpolithes fasciculatus Brgt. Hist. Veg. p. 146 7 but fruit separate large. They are crushed and not recognisable like those of Ca 59 which I put also with this species and many other nearly unrecognisable forms from Mayo creek. All these fruit should be more carefully studied than I can do it now.

3. Trigonocarpum Hildreth Dge. Penn. Geol. Rep.: p. 877. add to description: fruit (internal) 3 millim. long about 2 cent. wide, fig: p 529 fig 14. I refer to the same species T 3 which has the covering pericarp & shell removed and three ribs marked at the summit. The shell is not 1/2 mill one millim thick.

4. Trigonocarpus obtusiformis H. Two of our specimens. T. 22 & T 26 are from the form of the fruit and for its striae referable to this species as figured in Bindley tab 27 fig 28. But we have some other well preserved specimens, especially T. 2 & T. 4 which have the same form but are entirely smooth. Schimper in his description does not mention the striae and says that it is distinct from T. noeggerathi merely by it pointed form. If it is so these specimens represent evidently the species. See fig. 15 p. 529. One of these T 4 is much narrower see fig 6. has at the bottom an areola which the other has not. This specimen fig 6. is about of the same form as Bin. pl 27 fig 31 of the right side.

5. Trigonocarpus subglobiformis proposed. fruit ovoidal, conical oblong. 3 centim. long 12 mill in broad marked with three narrow costae with a basal areol. at the base showing the cicatrice of the fruit in fig 15. specimen T 8 has the same form and the same size but appears covered with its pericarpe and has not any areol. but is pointed at both ends. fig 16 p. 529.

6. Trigonocarpus Montagnianus Göpp. Brgt. in gently. Syst. Veg. p 145 tab 22 fig 21. in specimen, the only one T 14 figured p 529 fig 17. as seen by its ovate form to the figure given by Gutbier. but it is not striate and contrary to Schimpers description Traité Veg. Foss. p. 246. has shown some thing the fruit is not angular-costate in specimen unbonate at base. The point is bi apiculate and there may be the same kind of fruit with its covering shell. The surfaces are very much worn. The lobe mensions are seen in the figure.

7. Trigonocarpus Dawsoni H. H. ? in Schimp. Traité Veg. p 215. may figure p. 529 fig 18. a. b. Brown its form and large size the species answer the description of Schimper except that the three costae are very strong and therefore distinct. cinnamea Goep. minus distinctis. Compare H. & Bail. 3 Ser. 221 The base has a small umbonate areola or rather a lacerature of the shell showing the internal nut. Brown has in his collection many specimens of the same species. see p 461 & 6.

460 c

Saffordii

8. Trigonocarpus ? species propria. See figure 19 p. 529. A large fruit with its pericarpe, slightly triangular, ovate, truncate-pointed a rapex pointed round or truncate at its base with a very large round areola and three sharp carina. The surface is narrowly and finely striate. Pericarpe two millim. thick. The surface under it is quite smooth. We have two specimens. Fig 19 indicates the form and dimension of the smaller. F. 16 has its point inserted and broken. Its original size was more than 5 cent. long. It is slightly flattened, measuring 3 cent wide a the enlarged part and only 2 c. a the flattened one. By its taper pointed form and its large areola it differs evidently from the former species. Compare Trigon. Noeggerathi this vol. p. 31. fig. 16

9 Trigonocarpus carinatus ? sp. propria. See figure 1 p. 530 show the form size and internal structure of this fruit is it is seen in a number of specimens f. 29 from Mazon creek. The fruit is filled with a pericarpe thick and smooth in the internal pericarp. The point a shows a deep depression, remains of the form of the smooth surface. The internal part is filled with a pericarpe thick in the border more than 3 millim. wide. The border is broken and broken in two where the two borders are seen. The internal part is filled with crystallized iron and the base a where the border is broken is punctuated. The border is narrowly wrinkled around. The two horns appear like the broken border of some wing or fennel shaped appendage overlapping the fruit. Appears to be the same as 97 described this vol. p. 461 pl. 31. fig 11.

Del/0 10 Trigonocarpus Schultzianus G. & B. I refer with doubt to this species a number of specimens showing oval fruit, more or less distinctly and broadly striate in the length. A specimen which I have figured to exhibit the multistriate and other shorter smaller where ribs are generally more obtuse and less distinct which I called T. Sulcatus ? Mem. Calyptothes multistriatus ? Here is described and figured 2 Vol. Illinois rep. p. 460 pl. 46. fig. 2.

11 Trigonocarpus Saffordii ? p. 531. fig. 1. This fruit figured as above is from Mazon creek, sent to me by Edward W. Nelson of Evanston Ills. As seen from the figure, the fruit is narrower than the one of p. 529 fig. 19 though somewhat of the same form. Its round enlarged at its base, tapering up to a point 3 c. centim long nearly 2 cent. broad near the base which is marked by a broad areola alveola 1 cent millim broad and nearly round marked in the middle by a central round scar. The surface of this nut is covered by a thin shell, apparently at least, for at its split horizontally in a-a and show the shell to be less than half a millimeter thick. The surface near the base is smooth and polished. From the middle upward, it is irregularly wrinkled striated in the length. The top is marked by a point or papilla. The impression is very deep and the fruit does not appear to have been compressed being 6 t. 8 mill deep. — Specimen exam. 25 Oct 14 x ret to the owner The specimen is marked N. 1.

12 Trigonocarpus oblongus Hildreth. (See Fig by figure) A nut 2 c. cent long, 1 c. broad oval, acute or pointed on one side rounded at the other, three costate. One of the specimens is large striate but without ribs.

13 Trigonocarpus Carinatus ? Three views. See fig 2 p. 532 natural size. The internal part is filled with crystallized iron.

1 Cardiocarpus ingens Dgy Artis report 2 p. 311 pl 4 fig 4 41 a. nothing to add to description or to change except that at the point the fruit is not always so deeply emarginate.

2 Cardiocarpus appinis Dgy Mich. C. bimucronatus 2 R but for its broad wing. It is figured right as seen in specimen B 14

3 Cardiocarpus annulatus Newb. am. sci. p. 152. fig 2. apparently the species I have the specimens from the same place Cuyahoga falls. Though somewhat obscure the species of Newberry differs much from Dingens or its wing form, i.e. wing scarcely emarginate, its thickness of texture &c.

4 Cardiocarpus ~~Emarginatus~~ Taverton Dgy. I have not got the specimen on which this species is established. I think that Schimper is right in referring it to C. emarginatus Lesq Dgy which I have not seen figured.

5 Cardiocarpus emarginatus Artis, is very variable in form and most of the ~~specimens~~ are not pedicellate, are slightly obcordate at base more or less broadly ovate. Specimen B 6 from the same locality shows these differences to perfection. The difference in size is also very great, from 10 to 15 millim. in width.

6 Cardiocarpus (Holocarpus Dgy) subrotundus sp. prop. see figure p. 530 fig 12. fruit round, nearly 5 millim wide with a small and pointed nipple 2 mill broad, with a ~~narrow~~ ring narrowly encircling the base, the point touching in emarginate or split the wing narrowly at ~~the~~ its base.

7 Cardiocarpus (Holocarpus Dgy) triomatus Dgy the sp. p. 49. The description is good, every part but the wing made clear in figuring the specimen the wrong way. I think the figure 13 p. 530 is correct. But in every specimen there is attached to the nut a thin membranous wing which corresponds to the form of the nut, pointed on one side, rounded on the other, that is the emarginate form of the wing which corresponds to the point of the nut should be considered as the point of attachment and not the round uninterrupted form called base corresponding with the round end of the nut.

8 Carpolithes (Holocarpus Dgy) Artis spec. Dgy Artis gen. et sp. p. 313 pl. 5 fig 8 & 8 b. nothing to add to figure & description.

9 Carpolithes annulatus Newb. Lacoe spec. N 2011–211. I do not find any great difference between the specimen and the fig. and description of Newby the Bay Cat. p. 324 p. 43 fig 8 & 8 a. The nut is very much like ~~the~~ The nut is rather oval sometimes nearly round slightly flattened or subtruncate or subcordate at the base averaging twelve millim. broad and fourteen long generally slightly pointed and the surface plicate mainly that toward the point, quite flat. The wing nearly equally all around 4 millim. broad, narrowly emarginate at its top and narrowly split for the upper border to the point of the nut, thence upwards or by the ~~base~~ of the emargination and in the direction of the border. The narrow wing ~~from~~ the narrow emargination which descends from the top and border of the wing to the top of the nut and the great border, the specimens appear well enough to the specimens described by Newberry But in comparing it to a nut of Lycas and Juglans, described by Newberry but it does not appear to have been a hard coriaceous fruit or the fruit the nut is or does not appear to have had coriaceous fruit for it may seem to have been ~~coriaceous~~ even thicker and here we identify no hard coriaceous even thicker and here we identify no hard coriaceous ~~even~~ thicker and here we identify no hard coriaceous even thicker and here we identify no hard coriaceous even thicker and here we identify no hard coriaceous even

Rhabdocarpus

1 Rhabdocarpus maxillatus Lagu. this report p. 461 pl 21 fig 12 & 15. I have of this species only ca 43, with the nutlet shelled out from nothing to aid to its reception & figure. ca 38 & ca 19 are doubtfully referable to this species see 463 (21) 465

2 Rhabdocarpus clavatus Newb. in good specimen. Spinity figure is turned the wrong side. In two is round O with an undulated border and convex in the middle which is smooth

3 Cardiocarpus multiplicatus. Sp. nov. N. 286. 289. 290. 294. of Lacue. A little longer than broad, 1 cent long about. Very enlarged upward emarginate at the top with borders rounded both sides of the emargination. Inclosed cuttlet small oval acute at the upper part rounded below with one or two lines of envelope or surrounding it.

4 C. ? Catum Newb. N. 282, 283, (304?) of Lacue. I do not see any difference N. 283 has the nucleus a little narrower and more pointed and both with less distinct 282 has the wing more enlarged upward with a point broken but the nucleus of the same form and size. 304 is a separated nucleus larger than in the species and figured by Ng more like the nucleus of Cardiocarpus marginatum Newb. convex & Stockbad may be different.

5 Cardiocarpus Mansfeldi, sp. N. (post p. 33 from specimen No. 132. a splendid large fruit exactly ovate, eight centim. long, four and half cent. broad below the middle, flattened. Costæ, regularly but not very deeply with the costæ more or less broad, from 3 to 6 millim. joined at the point a circular ring; apparently bordered by a flat margin which enlarges to the base where it seems narrowly lineate. The whole is covered over by a coating of coal about 1 millimeter thick, with the inner surface and of which only remnant are left. It may be a Trigonocarpus and has some likeness to fig 34. copied from p. 530 fig 4 Carpolithes Howardi described p. 462 b. 4 The base is formed by a clasp which covering the fruit and which by being taken out leaves the hyaline border shown in fig. I see below fig 7

6 Trigonocarpum Davisii? The collection of Mansfeld has 6 or 7 specimen comparable to fig 48 of my plate and also to 44 & 45. The fruit an oval 5-6 cent long 2½ to 3½ cent broad without a border which is 2½ or 2 millim broad marking a epicarp generally totally destroyed except toward the borders where it is seen very thin ¼ of a millim. thick or less and smooth with the surface of the Decorticated fruit. It is generally pointed on one side or bearing a short broken pedicel marked upon the surface by obscure striæ or by a strong wedge as of a trigonocarpon of which the mesh part could be seen merely. There may be two species and I separate them so. marking N. 145 a. b. c. Trigonocarpum Davisii? 146 a, b. C. Rhabdocarpum Boehsianum? Goepp. The ribs are broad sometimes obsolete the inside nut is smooth without ribs narrowed 5½ cent long one by cent inches broad.

7 Carpolithes Mansfeldi. May be a form of C. multistriatus but the fruits are generally much larger. One form represented by 3 specimens corresponding exactly with fig 4-7 of my sketches p. 580. I find even in the box of one specimen an enlarged border as marked at the point of fig 4.

8 Carpolithes membranaceus Lesqx. Two fruit 739 & 739 c of Lacue appear to represent the species the an oval small nucleus same form and size as them described and figured by Lesqx p. 25 pl. I fig 19-21. with the enlargement glued to them and mounted as 739 b 739 seems to have a ring and may be referred to Carp. minus Newby.

Genus RHABDOCARPOS, Gopp. and Bergr.

Fruits oval or cylindrical oblong, marked lengthwise on their surface by narrow equal striæ.

Rhabdocarpos clavatus ?, Sternb.

Pl. xxxi, fig. 11.

Our specimen much resembles the figure given of this species by Geinitz, in Versteinerungen, pl. xxii, fig. 13, though it is much larger than the fruit figured by Sternberg. The endocarp is about round, elongated upwards in a *collum* resembling the neck of a bottle; its surface, which is somewhat convex, is a mass of coaly matter, out across by deep wrinkles, caused by disruption; the exocarp surrounding it is about one line thick, of the same shape as the endocarp, but slightly enlarged at the point and funnel shaped. It looks of a harder texture than the internal fruit.

In a concretion from Mazon creek.

Rhabdocarpos mammillatus, Sp. nov.

Pl. xxxi, fig. 12 to 15.

A fine small nutlet, quite entire and separated from the stone. It is apparently of a hard texture, oval, marked on its surface by regular, distinct deep striæ, running down from the borders of a smooth mammillate top to the base, as seen fig. 14 and 15.

The surface of the nut is a thin shell which, as seen from a small part which is detached, covers a hard, smooth fruit.

From Mazon creek, in concretions.

Genus CARPOLITHES, Sternb.

Ill. Geol. Rep., vol. ii, p. 460.

Carpolithes corticosus, Sp. nov.

Pl. xxxi, fig. 17.

A small flattened nutlet, oval, short pointed at one end, (the point turned on one side) and covered with a thin yellowish membranaceous pellicle. It is surrounded by a proportionately thick pericarp, having the same form, and being a compound of crystallized iron.

Mazon creek; in concretions.

Carpolithes persicaria, Sp. nov.

Pl. xxxi, fig. 18.

A small fruit, one-half of an inch long, only half as broad, oval elongated, pointed at one end, slightly emarginate at the other, with a thick exocarp, and an internal compound of the same form, but of a softer substance. The outer wall is preserved, while the internal part is nearly destroyed. It resembles a small kernel of a peach.

On shale found at Murphysborough; and poorly preserved.

1626. #1.

Carpolithes vesicularis, Sp. nov.

Pl. xxxi, fig. 19 to 21.

This kind of fruit resembles a small bladder, which, by compression in various ways, has taken different forms. It is generally elongated, more inflated and obtuse on one side than on the other, cylindrical. Its surface is smooth, generally covered with a thin coating of coaly matter, marked with broad wrinkles and undulations, as in fig. 19. Fig. 21 shows a kind

1. Carpolithes vesicularis Lyg. I find these fruits? in plenty on some shale (museum of comp. Zool. Cambridge) collected at Potts ville by Lanborn Feeney: they are borne at the end of a stem? resembling a leaf of Sigmaria and very variable in form. They may be the bases of a fructifying fern? but rather appear a kind of bladdery organ attached at the end of some floating leaves like those of Sigmaria. Some of them are nearly square measuring 3/4 cent. long or nearly two cent. broad. They appear to have formed the nucleus of the carpolite. umbonata of Hamb. (15.8.71.). see 463 & 14

2. Carpolithes platimarginatus (platimarginatus in Schp pal.) ~~The two forms which I have described under this name in Hll's report & pl 4 p. 312 Rep. fig 6 and in Penn report 87. Pl. XVII fig 12.~~ slet appear referable to two different pieces. The one, the first, is oval oblong, larger in size. The other smaller is to be inverted but smaller. I see no regular transitional forms but I think that they may be considered as identical, the first resembling Trigonocarpus Noeggerathi, the second T. amygdaloformis. I mark them. The first as type, the second as a variety. The Museum has numerous specimens. The specimen figured in Hll's report is to be inverted but there is an envelope generally transformed in coal which extends upwards like wings. as corrected in my copy of the Hll's report. The specimen in the Penn. report is ~~obtuse~~ Carpolithes striated with a large rib or stria in the middle Both are Trigonocarpi.

3 Carpolithes Jacksonensis Lyg. The figure in Hll's Geol Rep.t 2 pl 46 fig 4 is incomplete. I have completed it from better specimens in his vol p. 530 fig 2a which shows the fruit as orbicular and 2b which shows it decorticated. The centre is a thin coat of coaly matter (cast of medullary?). The size of these fruits is round as the same as in the figures. A specimen in Lea collection No 2236 shows the fruit 5 cent long, 2 cent broad in the middle with five broad costae, rounded at one end, narrowed and truncated at the pendulous attachment

4 Carpolithes Torrendianus Lyg. Much like the former but nearly twice as large. The fruit in its integrity, as figured Rep. 530 fig 3 is nearly 7 cent. long, 2 cent. wide ovate-linear slightly sigmoid shaped more pointed at the top, somewhat ~~obtuse~~, marked by 4 parallel striae which in old fruit are deep and form elevated ribs between them. Nothing more can be seen of this fruit which especially in a decorticated state much resembles the former by its elevated ribs. I do not consider it however as the same species.

5 Carpolithes Species propria? I do not know as yet to what species are referable the four specimens figured. p. 530 fig 4. 5. 6. 7. Fig. 4 represents a flattened fruit of the form and size of a sunken egg, or nearly exactly oval, size of the figure, apparently enlarged at the point by a kind of small emarginate obtuse wing. It appears to have a large border, is marked on one side by a more distinct line, though not strong and its surface is shiny and obscurely striate. Coat of its surface is covered by a very thin coat of coaly matter. Fig 5 is from a nodule, partly broken the point and base are broken or corroded. It is ovate in outline but contracted in the middle somewhat violin shaped. It is marked on one side from a. to a by a prominent ridge and has on the other side b another elevated ramp less distinct than a or b. It is bordered all around and shiny and obscurely striate. Fig. 6 represents one half of a very large fruit? if it is a fruit. It is broadly ovate, with a broad border, irregularly striated ~~lines~~ of the striae nearly in the middle being very deep like folds in the stone. They most of them are converging to the base where they are lost in a deep cavity under the border as seen in the figure. Fig. 6. is from a specimen also imperfect and quite flat. It is equally striate or costate in its length and though broader may be referable to what I have

Compare Mansfield see below p 463 & 9

considered as Carpolithes multistriatus Steen. They specimens may represent only one species or perhaps four different ones. They are placed with the fruit as indicated above, 5th, and their nos are marked with the figures

6. Carpolithes bifidus Lesq. Penn. Rep't p 877 Pl. 17 fig. 10. The specie is perhaps a new one and may be called bifidus. But I have probably represented it in the wrong way and from an uncomplete specimen which is not on hand now. The form of this species are represented p. 530 fig 8, 9, 10, 11. Fig. 8 & 9 appear to be entire fruit surrounded with their pericarp, the point always turned to one side, at base apparently so; fig 10 & 11. fruit crushed and without pericarp, both probably turned the wrong way and the base apparently stem being broken remains of the pericarp. In its entire state the species is somewhat like Carpolithes diospiroformis in Newberry Flora pl 45. fig 4. see p. 463c 14.

7 Carpolithes dispandus Lesq. Penn Geol. Rept. p. 877. Pl. 17 fig. 11. I have only a broken specimen, counter part of the one figured as above. It is probably the obovated part of some fruit perhaps the internal nucleus of the former species

8 Rhabdocarpus arcuatus Lesq. Ky Geol Report vol 4 pl 2 fig 8 and 8a. See a copy of the plate in my Ill. S. R. p. 130. The figure is good. Compare it with description. The fruit is evidently petioled, the petiole very distinct and longer than figured. I have corrected it from specimen 30 another specimen 32 from the same place shows a somewhat rounde fruit 16 millim wide 4 cent. long, without the petiole, not narrowed in the middle, oblong obovate and abruptly impedicate, with a short apex, irregularly and deeply striate wrinkled in the length. In specimen

9 Carpolithes ciliato Lesq. Ill. Geol. Rep't 2 p 461 pl 46 fig. 5 Specimen somewhat broken. nothing more to be stated but what I have described & figured see p. 466

10 Carpolithes regularis? Stern. 1 pl 7 fig 2. This small species is very doubtfull. His oval as marked in p. 530 fig 14 with a central oval nutlet and apparently a thick narrow border which like the nut is plicate striate in the length. It looks as a diminutive form of C. radiocrenatus see p. 464c 2.

11 Carpolithes retusus Hunt. The specimen referred to this species is a number shows exactly the characters of the figure in Hunt 1 pl 7 fig 7; 10 & 11 They are copied p. 530 fig. 15 the fruit is thick to date obtuse, very thick and scarcely obtale lengthwise, the same size as in the figures; in its compressed state it is very convex and in one of the stone its ventral is or the contrary deeply concave. Not mentioned by Shimper Altho the set of specimens show a concave fruit of the same appearance but round oval, not emarginated only slightly pointed and slightly truncate at base it is probably another species but specimens not yet detected. I unite it with this species Martin specimens? It is apparently Carpolithes ellipticus Stern as figured by Gaertn pl. Tab 22 Fig. 28;

12. Carpolithes minimus? N. an oval cylindrical seed obtusely pointed both ends much like Rhabdocarpus minutus Lesq. one of the same size and outline. It may is perhaps a young fruit of the same form and larger. May be referable to the genus see p. 463a

13 Carpolithes punctulatus Lesq. N. Branch of nutlets oval elongated obtuse at both ends folded in irregularly ribbed smooth appearing to contain a nut surrounded by a wing see p. 530 fig 16 a. Three fruits appear attached upon both sides of an axis, forming a kind of panicle or raceme. Fig 16. represent fruit of apparently the same kind fully ripe and separated from the axis. They are very smooth and also surrounded by a border of which broken remains are seen. What is described in Ill. Geol Rep't 2 p 461 pl 46 fig 7 represents a form of the same species. Fig 16c of the rod is apparently an immature form

14 Remark. The fruits that it would be useless to wait describing the fruits untill we have complete specimens of the oval generally surrounded by a pericarp in the natural state have rarely been preserved in their integrity they are mostly flattened and if we have to know the exact and sufficiently it is necessary to describe what we have

16 Carpolithes reticulatus Lsq. Nothing to add to description &c. this vol. p 462 M. 31 fig. 19 & 21. The species is represented by a large number of specimens all of variable form and some twice as large as those figured here. See 463 c 2

17 Carpolithes bullatus Lsq. Add to the description of this vol. p 463 that the fruit, if they are seeds are generally attached close to each other & packed in long strings or bunches one to 1½ cent wide. There is no trace of an axis they are represented and crowded on & glued to each other. They vary in size from 1 millim. to 3 millim. and all of the same kind are of the same size. Their forms are curved in various ways. They can not be considered as fruits or seeds, I think. They appear to have been more or less fleshy when recent. Also referable to eggs?

18 Carpolithes ? sp. Seeds. Scattered in shales, especially at Nelsonville Ohio. There are a large number of small 1½ mil. wide seed-like with a thick coarse reticulated coat or surface which may be referable to some species of reptile? Sometimes we have a large number of specimens in a large circle & more representing what I have considered and described in this vol. p 463 & 31 fig 25 & 25a as seeds of Reptilians. They are generally grouped in circles as seen in the figure. But one shale Lc 136 is entirely covered with them or something of this kind with but little of the form. They rather appear reticulation and are not bigueate. They are not referable to the same species. See in this vol. note of Bigsby in Grand Lusignem p 18, foot note

19 Carpolithes ? sp. Fruit ? Although we have a large number of them fructification in racemes or bunches I was not able as yet to find a good of the fruits separated for drawing. This as seen in fig. 18a p 530. If gotten by compression either upon the branches or when in the state of petrification then small seed fruit apparently nestled in a kind of bag or fruit distorted and disfigured. The pericarps is therefore seen of various forms. Fig 18b. shows enlarged. They seed are placed horizontally around a main axis and peel-caller. Carpolithes ? sp. Fruit ? Name to be changed. ? a remarkable fruit. See Lesquereux p 365 & 366; p 530 fig. 18 Dendrotheca macrocarpa Prof. Fruit ? Name to be changed. ? a remarkable fruit. Branches very long. I have seen one specimen at Prof. Salisbury at least 2 feet long always of the same size and form. The axis is 3 millim broad, irregularly striated and marked in spiral by oval depressions mark of point of attack of the fruit. Fruits inflated, broad, truncate at base and terminate by their whole base truncate at the point, 16 millim long, 5 millim broad, pressed upon each other and forming a kind of long ear. Like the forms, this fruit or seed or formation of fruit has nothing to do with the fruit of plant they may resemble. Fig 28 is the only specimen to what point of plant they may resemble. Fig 28 is the only specimen. Fruits compressed and flattened flat, these fruits are scarce 1 millim thick, & their compressed and flattened flat, these fruits are scarce 1 millim thick.

19 Carpolithes bisulcus Lsq. There is in the collection of Hazleton, Lafayette college a specimen of this species (p 530 fig.) which perfectly agree with fig. 11 & 11a of the same pay and also with the figure in Penn. report. The fruit is curved, divided in two parts are separated from the other both either split or divided in two locules in a.a. The lower part appear to be a pedicel and the fruit is therefore turned. The right character. The part of the pedicel is grooved 2 a 3 deep striæ

20 Carpolithes fasciculatus Lsq. A branch or crushed seed is upon Hazleton spec. of which one of the fruits is represented p 530 fig. 20. The top of the fruits is evidently opened and the surrounding pericarp appears thick. Most of the fruits are flattened or crushed but the general form is like that of the figure See p 465 31

21 Carpolithes ? Rhabdocarpus ? manillatus Lsq. There is in the coll. of Hazleton a very few specimens of this species. The nearly exactly round the point sinking into the stem covered a less marked apex fig. 21. p 530, right side by a thin epicarpical envelope, not thicker than paper but thick enough to discern the striæ, marked in the length by 14 (upper side) regular deep striæ, obtuse at the top. The shade on the side of the nut, right side marks a deep depression caused by the convexity of the fruit. Another specimen has three fruits of the same species and size; more or less evidently distorted, their number seem to refer them to a raceme.

1. Carpolithes bisectus Lesq. The counterpart of the specimen described above N°19 is figured 7, p. 531. This part is convex and indeed shows evidently the pedicel of the fruit. The part of the right and representing apparently the pericarp detached from the fruit.

2. Carpolithes reticularis. Lx. I find them also at Connelton Beaver Co in the specimens of M. Mansfield. They are here mostly quadrangular, elongated. The largest specimen p. 531 fig 13. see N°5.

3. Carpolithes ? Pl. p. 531 fig 14. The fruit is nearly circular, slightly more elongated on one side than laterally, with borders somewhat wrinkled in the length or arcuate and the top marked by two semi-lunar obscure lines. Has convex in the middle, all smooth covered with a coating or pericarp of waxy matter about the thickness of thick paper, destroyed in the middle as marked by the black lines upon the figure. In the same plate there are two other specimens one little 14c which indistinctly show a marginal line at a distance from the border diverging from a top pointed line as seen on the specimen. The other specimen fig 14c is oval. convex or inflated in the middle, surrounded by a flat border apparently a pericarp.

4 Carpolithes disciformis? Ge'n. see specimens. 16 cat. p. 63. There are 13 specimens from Seven Stars which are like the fig. of Germitop Pl 22 fig. 28 229. all round or irregularly circular, with a central small convex centre surrounded by broad inflated border, variable in size from one half to nearly two and one half cent. in diameter. Has a fruit or an organism of the same character as C. reticularis; inflated and flattened by compression. but the form is regularly round. It is in number with the two species following.

5. C. reticularis reticularis, Lesq. N°s 254 &c. 25 spec of Lacoe coll. represent this species in its multiform forms. Most of them are irregular, triangular or little bladders compressed in many direction and also of various size a few are exactly and narrowly elliptical.

6. Carpolithes Dechenianus Lesq. Lacoe spec. N°s 224 2223 represent this species which is very common in our Coal measures, and what is apparently the same as the one described as fig. by Newb. U. Rep. II pl. 43 fig 15. as Trigonocarpon ? in figure

7. Carpolithes Nanatus ? H. Lacoe spec. 405 has a small carpolite represented p. 531 fig 20. Its form is like that of C. fasciculatus. But it is smaller, the internal nutlet fractured at the base and the nutty distinctly seen with the border of its surrounding envelope. It also resembles C. ovatus of Newb. Of 7 fig 14 a but is smaller. It resembles Carpolithes minimus H. Ogden of Lacoe under this name

8 Carpolithes. (inuguis). Lacoe 373. Pl. 34 fig 301. Fruit flattened to about one cent. thickness. round oval, 6 cent long nearly 4 cent. inches broad slightly truncat at one end and slightly cuspidate at the other, with very smooth and black surface irregularly lineate the lines or striæ being very shallow not even clearly definable. Both sides are convex and present the same appearance. This fine fruit has some analogy to the internal nut of C. multistriatus. But it is far different by its woody oval, nearly round form, its smooth surface and its size. I do not find any to take

9 Carpolithes Mansfieldi Lx. is the species briefly described p. 462 b 5. This species represented by Ma 151c. an exactly oval fruit obtusely pointed at both ends and figured Plate, fig 33. The figure has not however the kind of top covering a convex observed upon this specimen and which covers the top like an inflated mamilla. The figure is exact. The species is broader and far less deeply and distinctly striate than C. multistriatus

see Carpolithes p 465c

of inflation or convexity, surrounded by a flattened border, resembling an endocarp and its exocarp. This form may be merely casual.

Morris and Murphysborough; abundant in the shales over the coal.

Carpolithes bullatus, Sp. nov.

Pl. xxxi, fig. 22 to 24.

An agglomeration of oval or round, small, wrinkled seeds, resembling vesicular spores, all nearly of the same size. Like the former, they appear to have been of a soft vesicular texture. Fig. 24 shows them enlarged.

In concretions from Mazon creek.

The surface of the stone transversely cut, is covered with them.

Sigillariæ? Semina, (Seeds of Sigillaria?).

Pl. xxxi, fig. 25, and 25*a*.

The concretions of Mazon creek contain agglomerations of small seeds, united into cylindrical-ovate clusters, about one inch long, nearly half an inch broad, obtuse at both ends, without trace of any common receptacle to which they might be attached. These seeds are rounded upwards, triangular and tapering to a point downwards, as seen in fig. 25*a*, enlarged five times. The space which contains these seeds in the middle of nodules, is filled with a calcareous, white compound, in which the yellowish brown seeds are imbedded without any apparent regular order.

On the shales at Morris, where clusters of the same kind have also been observed, the agglomerations are flattened in irregular round patches, about one inch in diameter, no more than half a line broad. Though these seeds, by their form and size, are similar to those which have been figured by Goldenberg in his Fl. Sarr., 2, pl. 10, fig. 1 and 2, as seeds of *Sigillaria*, and also to those remarked under the scales of true cones of *Sigillaria* found in Ohio by Dr. Newberry, their generic relation is still uncertain. They are evidently referable to some species of the family of the *Selagineæ*.

Collected by Mr. Jos. Even.

ORGANS OF UNCERTAIN AFFINITY.

Genus PALÆOXYRIS, Brgt.

Ann. Sc. Nat., xv., p. 456.

Spindle-shaped strobiles, covered with closely imbricated rhomboidal scales, disposed in spiral order, the inferior ones passing to an angular pedicel, the upper ones lengthened into linear appendages.

This description is copied from Unger's genera, and though inappropriate for the classification of the species referred to it, this genus is preserved, with its diagnosis, for the good reason that, as will be seen hereafter, the true nature of these organs is unknown.

Palæoxyris Prendeli, Sp. nov.

Pl. xxvii, fig 10 and 12.

A spindle or bottle-shaped body, appearing like a flattened small bladder, enlarged in the middle, tapering into a long neck, more abruptly rounded and narrowed downwards into an obtuse point, surrounded by a double line of thin but deep filaments or striæ, scarcely half a line distant, often close to each other, ascending in spiral form from the basilar point, at first in an obtuse angle with the borders, but elongating upwards and ascending into the neck where they become nearly parallel to its sides. The surface of this capsular body is formed of a thin pellicle, and by its compression, the spiral lines of both sides are marked upon it, thus forming, by their crossings, a trellis of more or less enlarged rhomboidal divisions. In ascending into the neck, the spiral lines approach

1. Palaeoneilo. Germar in his Versteinerungen has published Lz. 7. f. 95 tab 33 fig 3. Palaeoneilo carbonaria Schimpe which is described by Schimpe Vogel tal. 2 p. 516. Hab from the upper carboniferous red sandstone or from the Permian as remarked by Schimper p. 517. The species resembles from the Drawing only Palaeoneilo Grendelij but in my specimen the base is broader more truncate the spiral turns more distant and the upper part more narrowed into a longer collum. (21.7.71

2 Palaeoneilo Lubbocki John. sp. nov. This species is much larger than the others published here with. From the base to the top of the spike or beak it is 7 mill long and its width is nearly 3 mill. The bases are broad. 5 mill in width deep sinus or sulcus. The spiral appears to be formed by one big folded at the point, the two parts remaining parallel for a lenght of 3 mill and then going in spiral upon each side and forming a kind of spindle shaped fusus. The upper bases are broken perhaps and show the form and direction of the lower ones. Though this may be it can not be considered as a kind of keel. This species is not as large as Spirangium Munsteri as figured by Schimper Atlas Pl LXXX fig 2. It is also little if by its double row of spirals crowning each other, but it is not quite as regularly spindle shaped nor as regular as the spirals. However our specimen is somewhat broken and the comparison can not be easily made. Di 104 from Mons. 44.

3 Spirangium intermedium sp nov. Body, about 6 to 7 mill long, 3 mill thick spiral close, three not to 3½ joined by inflated twisted bands forming rhomboidal areolae. The ending bands tapering gradually to an acumen and the shell apparently twisted. The bands are twisted like twines, not flat.

4 Spirangium rugosum? sp nova. Di 104 from Mons. Palaeoneilo plicata Sow above? The body with spiral is 6½ cent long see and described for Jeque which is exact. The terminal linear obtuse end is apparently shaken.

464c.

1 Cardiocarpus & Cyclocarpus. - See Brgt. on Grand Eury p. 15. (1), Schpr. Pal. II p. 224 III p. 567.

2 Cardiocarpus (Cardiopteris regularis) H. is right for figure 31. a Trabe of Mansfield is covered with a large number of thin seed. They adhered mostly when seen with the glass. They have no border. The central nucleus is rarely disclosed. The surface is comparatively thick bark of Cocky mette. From appearance these seeds have the character of Cardiocarpus but very small. They are extremely rare and obtuse as in any figure a little narrower, longer and distinctly pointed. Some of them. They average five millimeter broad and seven long. They represent both C. elliptica & C. regularis H.

3 Carpolithes minimus ? H. fragment of shale of the Anthracite covered with small oval seeds Ca. 21. Shamokin alate at the base obtuse at the other end round or very convex when half immersed in the shale 5 mill long 2½ mill broad or indiamete, surface very much polished. Have seeds covered little C. minutus of H. but smaller, especially narrower more acute without trace of border.

4 Cardiocarpus elongatus. Neb. I refer to this species a number of specimen 144a of Lacoe which are exactly like the fig of Newberry except that the wing is large near the base and continuous to the basal point where it is abruptly rounded both sides and quite near as in the figure which is erect. H. Newb. fig is right this is another species. It is also like sanguinis subacuta Gp. Dg. Pl 33 f 5 but the two parts of the wing are united at the top of the seed in Lacoe is like var. with nucleus smaller 5-6 mill long 3 to 4 broad.

5 Cardiocarpus late alatus is right as figured. But as some of the specimen have a concentrate & one and other none the characters are it seems near C. zonulatus and these species may be mere varieties of ones Lacoe p. 46 & 147.

6. C. zonulatus L. Lacoe 147 & l. c. The typical specimen is 147 b. This can not be same as C. elongatus or C. late alatus. The nucleus is much longer rarely zoned and then as in f. 45 which shows it distinctly. It is of evidently a different character.

7 C. annulatus Newb. is represented in Lacoe coll. by N. 200 in hoeni specimen slightly variable in the more or less oval acute shape of the nucleus but exactly concordant in characters

8 Cardiocarpus congruens, Gp. Fig. I refer to this species a number of specimen of Lacoe. N. 135 which agree entirely with Gp. Dg description & fig. Pl. Carb p. 23 Pl. 26 f. 21. The seeds are little variable in size from 6 to 8 mill. long

Cardiocarpus
Carpolithes fasciculatus Dn. Lacue specimen 612 represent a group of
thorn oval nutlets as described 463c & 462c. Few of them turned in the same
direction and as along an axis or branche are distinctly seen but
the point of attachement and the beack is not distinctly visible
The nutlet are oval, inflated, lunuceat & convex in the middle
averaging 1 cent. long, 7 millim broad, including a narrow flat
border, one millim-broad. The inside nut is harder & thicker & it
is not compress and flattened like the epicarp and has the same
oval form being obtuse at both ends.

4 Rhabdocarpus marmillatus Dn. Of two specimen N° 665a & b Lacue coll.
one is 1 cent long 7 mill broad the other 1 1/2 cent long 1 cent broad both oval broadly
obtuse, imbedded into the stone so that the point (apiculus) is not seen.
This is a Rhabdocarpus on the band on the figured specimen f 32 of Atl. is rather
a depression caused by the slipping of a part than a border &c. p. 463c (21.)
The three are obtuse very distinct. mostly regular & continuous are shown but
f 33 & 34 Carpolithes lagenarius. St. Pl VII f 16 represent it exactly but
with a surrounding which marked it a Cardiocarpus and the specimen 32
is wrong. The fig. is copied from Tondee. mercen

2 Carpolithes elliptici St. Pl. VII f 1. Lacue has two specimens, 133 a, b, c,
oval which are referable to the species of St. N° 281. they are exactly oval, ~~with a some~~
~~what upper surface~~ ~~eight cent long five broad they are exactly like Carpolithes~~
~~of Pl. XVIII but smaller~~ with an elevated thick border by compressa and of
~~applied in the middle~~ four mill long. 2-3 mill. broad as described by schimper, smaller
3 Carpolithes bivalvis, Sternb. 82. is represented in Lacue by N. 156. a b c g. 3. variable in size slightly
C. minimus St. Hopea 156 d. January. C. membranaceus Goe. 82. b N. 156 e. f.
equaling f. 20 a & 21 of Goepp.

4 Rhabdocarpus. Sp. nov. Spec. 153 a b c d of Goeppert represent a small species
very much like B. Buchsbaumianus Goepp & Berger but much smaller. The
best specimen 153 a is seven millim long three and an half mill broad surround
by a narrow upraised border marked by two deep uncan furrows separating two
obtuse costa rather or a middle broad costa with two furrows one on each side and
and the elevated border on both sides. The one specimen present about the same
character only one has like a counterpart, that is a deep medial obtuse furrow
between two obtuse costae separated from the borders by narrow furrows. I found
nothing analogous to this except Rh. Buchsbaumianus but this species is not
half as large — Yes! it is like f. 10, 11, 12 of. Weiss Pl. XVIII Carpolithes
(not specific name) only slightly narrower.

5 Rhabdocarpus Danaei Newby Lacue has a specimen 667 b from the sub con
glomerate which positively agree with Newby fig of Pl. 44 f. 4. The internal
nut only it is of the same size and form and the surface except rel
thicker or irregularly streak lengthwise, rather rough. five to six mill broad
a nearly as broad as long, ~~cordiform~~ the base retuncate or cordiform
broadly obtuse on the sides, acuta or minutely cuspidate, hard with a polished
or smooth convex surface. The author compares this to Cord. californici, Hoff. It
does specimens are still more similar to Pl VII f. 9 & Pl. 1. which is
not described.

6 Rhabdocarpus insignis Dn. nov. The fruit is exactly fig 1 and flattened to 1/4 cent
thick long. oval rounded to a short mucro or acumen surface almost shining
Thick enough when cut rounded also. Two of the sides very thin nearly decayed and only
Mucro about two millimeters distant (see relation)

Fruits of the coal.

Trigonocarpus

These fruits are ~~often~~ surrounded by a fleshy epicarp which appears to have been somewhat pulpy. In that state it is difficult to see the relation of the outside ~~fruit~~ which does not correspond to the body the ~~Many specimens~~ A good many of the fruits of the coal appear to have been surrounded by a ~~pericarp~~ testa ~~fleshy~~ and or soft and pulpy outside cover for by compression this part of the fruit is sometimes displaced and ~~to~~ from lay spread around it in lacinia ~~what~~ what of these specimens of the same species ~~have~~ remained entire than their surface smooth, polished irregularly wrinkled by compression as would be the soft pulpy of a fruit by compression This is remarkably seen in ~~two~~ specimens from Carinella, representing large ~~fruits~~ fruits the same species. In other cases especially in Trigonocarpus the testa is hard easily separated and the endocarp or nut fruit is separated differs in its characters ~~and~~ identity of the species is not required

1. Cardiocarpus (Pachytesta Brgt. Nucleus subcordate or rounded and sublunate at the base ovate, rounded to an acumen corresponding to a boss of the ~~pericarp~~ testa, ~~testa~~ testa two, five millimeters ~~on~~ thick on the nucleus prolonged upwards eight millimeters above the point of the nucleus, both ~~sides~~ sides rounded and connivent with short angular ~~margin~~ ~~between~~ between the at the top. ~~testa~~ testa prolonged downward ~~and~~ also eight millimeters lower than the base of the nucleus ~~above~~ on curving into a short cancellate accessory ~~scar~~ scar or placenta. This species is very ~~pure~~ rare and distinct represented by ~~Specimen~~ Specimen 146. The nucleus and also the ~~ovary~~ ovary or testa is variable in size from 15 to 18 mill. long and 11 to 13 mill. broad. With the testa comparatively thick. This is of the same general character as the fruits described by Brgt a Pachytesta and ~~Pachytesta~~ Pachytesta
2 Cardiocarpus ~~Newberry~~ (Samaropsis) ~~Newberry~~ Mr. of Lacustrine ~~Geology~~ c.d.e appears referable to this

more and more, nearly uniting into one. The whole surface is marked with close, very narrow lines, running in the direction of the twining, and discernible only with a strong glass. The borders are smooth or without any projections.

On the specimen represented, fig. 12, the spiral lines are erased in the middle of the body, which is there undulately and irregularly wrinkled like the outside of an empty bag. As the form, the distance, and the direction of the spiral lines from under the neck and upwards, where they are distinct, are the same, I consider this specimen as representing a modification of this species by age.

The best specimen found to the present time, of all those referable to this genus, is that represented fig. 10. It was kindly presented to me by Mr. Michael Prendel, of Morris, for whom the species is named.

It is, like all the others mentioned here below, from the concretions of Mazon creek.

Palæoxyris appendiculata, Sp. nov.

Pl. xxvii, fig. 11.

Body spindle-shaped, ovate in the middle, tapering and elongated at both ends, filaments placed at about equal distances from each other, distance averaging the twelfth part of an inch, turning at the middle in a nearly horizontal spiral, descending downwards in a more acute angle, and abruptly terminating above and in ascending, in a concave straight blade, where they become parallel with its borders. On both sides, in the middle of the body, the lamina or substance intermediate to the spiral filaments, protrudes outwards forming irregularly pointed triangular teeth or appendages, which, however, are not marked at some places. This shows them to be the result of a mere mechanical lateral projection, like those which would be produced on its sides by the compression of an envelope, either formed of twisted, concave, semi-cylindrical blades, or of a soft bladder, surrounded by strong spiral fibres. Our figure may be represented in a wrong direction, or turned upside down.

Palæoxyris corrugata, Sp. nov.

Pl. xxvii, fig. 13.

Its form is, like that of the former, spindle-shaped, more elongated, and gradually tapering to both its ends. Its surface, irregularly folded and wrinkled, has not any trace of spiral fibres. In its upper neck, the body appears passing into parallel blades, while downwards it is bordered by two leaf-like appendages of a coriaceous substance. These linear blades are somewhat concave, the one bending downwards, the other upwards, like the remains of spiral, still half bent laminæ. The folds of the body do not show any peculiar form like the outline of a hard substance inclosed, but they are mere irregular wrinkles, like those which could be formed upon the outside of a crumpled empty bag.

From what is said in the above descriptions, it is evident that the true nature of the organs placed under this generic name is unknown. They cannot have any relation to the flower-bearing spikes of a *Xyris*, for they do not show any trace of scale-like bracts, forming a flower head, or of points of attachment of such scales; nothing that could be compared to flowers or to their receptacles. If these bodies were more regular, and appearing as though containing some nutlet, they could be compared, by the rhomboidal marks of the surface, to some fruits of palm, like those of the genus *Mauritia* or *Lepidocaryum*. But in all the vegetable organs of this kind, the disposition of the scale-like surface of the walls is far more regular than it is in ours. It is not quite evident whether the spiral lines marked on the outside are formed by the twisting of leaf-like blades, or by mere thread-like filaments. The variety in the distances between these lines, as seen fig. 10, tends to support this last supposition, while the lateral projections of the borders, in fig. 11, and the leaf-like appendages seen at the point and base of our two last species seem, on the contrary, to indicate a conformation by the spiral winding of grass-like leaves. In this case, it could be supposed that these bodies represent rhizomas of some plant like *Cordaites*, whose unfolding of the leaves is in a spiral, and which might be seen already folded in that way in the embryonic or radiculose state? After all, they may belong to the animal rather than to the vegetable kingdom, and represent envelopes formed in that shape by some kind of insects for inclosing the larvas. Their irregularity seems to dictate this conclusion. The two figures given by Count Sternberg in Vers., 2, p. 189, pl. 59, fig. 10 and 11, of *Palæoxyris Munsteri*, represent a species far different from ours; but if the figures are exact, they distinctly show that the spindle-shaped body is an envelope, formed by the twisting of three or four leaf-like blades, for at the upper and lower ends, where the twisting ceases, these blades separate, and are seen

0 Palaeoxyris corrugata Dy. In Gurley & Gipson's specimens from Ill'& Ind. there is a numbe of specimens of this species in nodules and none other. They all show the character as described. One specimen 75 of Gurley is prolonged into a long twisted point or braided in three lacinae which however are impressions upon a single narrowed leaf 5 ½ cent long and very narrowly equally nerved or lined like leaves of Cordaites.

1 - Carpolithes cicula Dy. Lacoe 938 (specimens 6) seem to represent the species but in different aspects according to the four immersed in the stone. One specimen has about the same shape as my fig. Ill. Rep. II p. 461 Pl. 46 f. 5; somewhat smaller but the borders are covered. It is crossed lengthwise in the middle by a sharp narrow costa and then appears a Trigonocarpus. P. 238 c is smaller also shows partly the borders and has it surface smooth only uneven in the middle lengthwise without trace of costa. Probably the other specimen show the plan of the testa or the testa burned in the middle. Two other specimens show the first border by a broad smooth testa with two [illegible] narrow furrows near the base where they are more distant to near the top where they are quite near as in this figure separated by an obtuse smooth ridge in the middle.

Compare f. 4-5. Pl. 1 of Fiedler. much like it.

(Neuropteris (Cyclopteris) rarinervis Bunb.) I have a specimen from Story Co. IA representing a large stem or rachis 3/4 cent broad, irregularly covered that covered with Cyclopteris leaves from 7 to 8 centimeters in diameter. These leaves do not seem to embrace the stem but are alternate attached by the middle on both sides of the rachis, covering it on one side and seemingly round, the point of attachement appearing as in the middle, covered and small 5 millim in diameter. Unhappily the specimen is not very clear but however distinctly show the size, form of the leaflet and their alternate position. The specimen has also a leaflet of N. rarinervis, less than one cent long. see below (3)

2 N. Cyclopteris angustifolia, Bngt. There is in M Story collection a fine large fragment of a frond of that species. The rachis is 4½ millim. broad alternately furnishing pinnæ at right angle and the ramifications or branches about as thick as the primary rachis, and 1 cent distant. These lateral pinnæ are very long but none is preserved in its whole length. The pinnæ a is fifteen centimeters long, it bears distant alternate pinnules rarely simple, mostly compound or triphyllous, having as N. hirsuta type six and a half small oval pinnules at the base of the large ones. These are 2 inches centimeters long in the middle of the pinnæ, shorter and smaller toward the base, oblong, gradually lanceolat or narrowing to an obtuse point, cordate at the base, basilar pinnules enlarged across, oval broader than long. The primary rachis also bears leaflets which however are simple and shorter, no trace of hairs is observable upon any of them. The distance between the pinnules of the main rachis is more than two centimeters. The pinnules are 1½ to 2 cent broad at the base where they are slightly enlarged. This ramification and arrangement is that of N. sinuculat. Bngt. see 4 Neuropteris rarinervis. Bunt. The position of the leaflets upon the main rachis of the above Neuropteris angustifolia indicates the place and relative position of those large cyclopteroid leaves remarked upon stems of M Story as described above (1). Another stem of M Story represents these leaves twenty centimeters in diameter.

D

to 467 b 2

3. Neuropteris angustifolia Bngt. Both specimen N 144 is a large piece of shale covered with leaflets apparently referable to this species. Though very variable in size from 1½ to 2½ cent broad at the base and from 2½ to 8½ cent long, they are all comparatively narrower than any form of N. hirsuta or N. cordifolia, all without trace of hairs. With very close nervilles ~~10 to 15 in cm~~ 40 to 60 per centimeter at the border; base either equal or more generally unequilateral, leaflets either straight or curved to one side (sagittate shaped) these fronds appear to have been subdivided like those of N. hirsuta. The specimen has with the large leaflets some small oval or roundous, ovate millimeters long and 6 broad. — I have from Cannelton a very fine specimen No. 179. of ultimate pinnæ compound of a large middle terminal leaflet and two basilar ones. which is the same species as that of Clinton. The terminal leaflet is a copy of Bronn. pl. 64 fig 5 Neuropteris cordata Eveldate. It is seven centimeters long, twenty three millimeters broad at the base and also at the middle, narrowed upwards to an obtuse slightly inclined point. The petiole

467b is not detached from the middle leaflet, it is eight millimeters long, flat, linear, two millimeters broad, marked in the middle by the continuation of the midrib of the terminal leaflet where it is distant scarcely two centimeters, dividing upward by anastomoses of the lateral veins, just as it is seen in Dryopteris. The pedicel bears at its base two oval oblong or deltoid leaflets open or at right angle to the pedicel, 15 millimeters long, ten millimeters broad inequal at the base and with a cyclopteroidal nervation. The veins of the terminal and lateral leaflets are many times dichotomous, scarcely inflated toward the base, measuring as marked above 50 veinlets per centimeter at the border. This species represents exactly Newropteris Cordaitis Presl. and perhaps also N. acutifolia and angustifolia Presl. Gutb. 4

+1 Newropteris spec. nov. N. Loschii affinis. Em. N. 27. This is represented by part of a penna, deltoid in outline, 7 cent. secondary pinnae nearly at right angle to the rachis, alternate, the lowest 7 cent long, rapidely diminishing toward the upper part, broken, pinnules subopposite, oblong oval-obtuse, the lower basilar part prolonged, auricle, altogether similar in form to N. Loschii; terminal pinnule oval obtuse, scarcely lobed, large as a; surface covered by a rough opaque pellicle of coal rendering the veins or nervation totally obsolete. A branch on the reverse of the specimen has this epidermis removed so the veins are there seen extremely fine, minute curved backward near the base, nearly straight toward the point of the leaves, forking alternately dichotomous, counting at the border 7-8 per millimeter which would make 175 to 200 per inch. The main rachis is convex a comparatively large, regularly linear in the length by parallel distant striae then veins or nerves. If this may be taken for a var. of N. Loschii, it is a remarkable one. This may be the species which I considered as N. orbiculata Roem. But the reference to the spec could be only for some fragments with rounded leaflets. Other pinnae have them lanceolate acuminate or pointed.

a.

2. Newropteris Clarkiana fruiting. Large specimen a pinna 50 cent long 50 cent broad. Near the upper pinnae dichotomous, the last pair forking. The upper pinnae are 25 cent long separated at base by differently formed leaflets as in my figure. The leaflet of both of the pinnae are fruiting. One is figured p. 532 fig. The sori are linear oval or obtuse at both ends (D enlarged) 1 millim long scarcely 1/4th millim. broad with a dense circular clear vesicle as in a, placed generally on two rows near the midrib in the direction of the lateral nerves. The specimen is 382a. fruit.

Newropteris inflata Lesq. A specimen from Arcola N. 542 has leaflet large cut only to show the terminal pinnule narrowly oval obtuse with even that lower no lobe at the base. The species like the small specimen I have figured from Arcola and these two specimens (140 a cent) I have in N. inflata and these may be merely N. tenuifolia.

N. acutifolia Presl. Gutb. Large specimen 550 has three leaves of this species varying from 13 to 21 millim at the base rounded, equal or inequilateral, and terminating in acute acuminate long pointed, the veins running through the leaf, dichotomously forking three and two times, I assume this reference to this species. May not be N. tenuifolia Gutb. Sternb. Lesq. Coal Flora Pl. XXXVIII fig. 1 Vol. III never divided in two as figured in Ia 1st Hep. and a Dyctopteris

linear and parallel, each about one-eighth of an inch broad, with the same form, size and position, at both ends of the inflated body. Such a conformation seems far more the result of animal industry than of vegetable organization.

The species hitherto referred to this genus, are, with the first-named: *P. Munsteri*, of Sternb., *Palæoxyris regularis*, Brgt., loc. cit., which, by its regular scale-like scars, is different from ours; *Palæoxyris multiceps* and *Palæoxyris rhombea*, two species of F. Braun, merely enumerated in Unger's Genera and Spec., without description. The two last species, like that of Sternberg, are from the Keuper Lias: that of Prof. Brongniart, from the Permian. Our species, represented in the lower part of the true Coal Measures, are therefore interesting to science, from their geological position.

Mazon creek, Grundy county.

The following species have been found and communicated to me since the preparation of the plates: and have not yet been figured:

NEUROPTERIS MICROPHILLA, Brgt.

Foss. Flor., p. 245, Pl. 74, fig. 6.

Represented by two specimens from Mazon creek, which, though showing the characters marked by the author, do not distinctly indicate whether the species is truly a distinct one, or merely a small form with obscure nervation of *Neuropteris Loschii*, Brgt.

NEUROPTERIS ANGUSTI-FOLIA, Brgt.

Foss. Flor., p. 231, Pl. 64, fig. 3 and 4.

The specimen is an exact representation of Brongniart's figures of this species. The surface of the leaflet is smooth or without hairs; the veinlets somewhat coarser, and not quite as distinct as in *N. hirsuta*, are marked at the upper part of the leaf and at the base of the veinlets by the same kind of swelling or tumor which is seen in the author's species, and has been considered by him as remains of fructification. The leaf at its base is elongated on one side in a kind of auricle, and abruptly narrowed or truncate at the other, linear lanceolate, obtusely pointed with a comparatively broad pedicel one-fourth of an

inch long. This last character seems to unite this species to *Neuropteris Scheuchzeri*, Brgt., which the author considers as probably identical with *Neuropteris angusti-folia*. I have lately received from Mr. S. S. Strong, and also in a concretion from Mazon creek, a splendid specimen representing the top of a pinna of *Neuropteris hirsuta*, Lesq., in the process of unfolding, or still curved in spiral, whose leaflets, very hirsute on one side only, are narrow, linear lanceolate, and unequal at base, exactly like the leaflets of *N. angusti-folia*, Brgt. I am, therefore, not yet satisfied that this last species is a distinct one, and still believe that it may represent a form of *N. hirsuta*, as it has been explained, Geol. Rept. Penn., p. 857.

Concretions of Mazon creek; from Mr. Even.

Neuropteris crenulata, Brgt.

Foss. Flor., tab. 64, fig. 2.

I refer with doubt to this species a specimen procured by Mr. S. S. Strong from the concretions of Mazon creek. It represents the upper end of a pinna bearing oblique, oblong, obtuse leaflets, attached to the rachis by the narrowed base, forming a broad pedicel, and of the same form as those figured by Brongniart. The upper leaflets are simple, the lower ones compound, or bearing on each side at their base a round, small, cyclopteroidal pinnule. The medial nerve of the leaflets is obscurely inflated, the veins and veinlets are distant, arched, distinct, not inflated, forking once or twice; the borders are slightly crenulate by a contraction of the epidermis at the point of the veinlets. Our specimens agree well enough with some of this species obtained from Pennsylvania, as also with the description of the author. There is, nevertheless, a difference especially marked by the division of the inferior leaflets with small round pinnules at the base, like those of *Neuropteris hirsuta*, a division which has not been heretofore noticed in this species. The teeth of the borders are also less prominent and distinct on our own specimen.

Callipteris Sullivantii, Lesqx.

Ill. Geol. Rep., vol. ii, p. 440, Pl. 38, fig. 1.

Some specimens, in concretions from Mazon creek, show the lower divisions of the pinnæ more elongated, and pinnately cut-lobed, as in species of *Alethopteris*. This kind of subdivision would therefore indicate the place of this species in this last genus, as admitted by Schimper, Paleont. Veget., p. 561. But the peculiar nervation of this fine fossil fern, which is half neuropteroidal, has

1. Callipteris sullivanti Lqy. The specimen Cal 5 of the museum has the middle leaflet more than one inch long or still longer for the top is broken off. Both the lowest or rather the lowest on both sides of the pinna are deeply undulate-broadly lobed, the inferior lobe attached to the point of junction of the main with the secondary rachis is broadly reniform with the nervation of a cyclopteris and therefore without trace of a medial nerve; the other lobes have trace of the medial nerve ascending to the middle. The specimen should be figured. 20/6/71 —

2. Callipteris sullivanti Lq. A specimen Mc 112 shows the pinna with small leaflet, the ultimal pinna long linear lanceolate pinnules only 12 millim long 6 millim broad towards the base, leaflet slightly enlarged same character of nervation as in C. sullivanti.

469 k. A

1 Alethopteris longifolia. (Goniopteris) A small specimen of an ultimate pinna with clear nervation. N:1921. Lacoe is figured 5. f. 532. with the nervation enlarged. Harrisonds exactly to that of Brongniart. The pinnule is of nat. size.

a close analogy with the species admitted by Brongniart as the type of his genus *Callipteris*. When better known it may probably indicate the character of a new genus.

ALETHOPTERIS LONGIFOLIA, Brgt.

Foss. Flor., p. 273, Pl. 83, fig. 2.

The specimen, a fine one, represents the upper part of a pinna, with a broad half round rachis, bearing alternate, horizontal, narrow, linear, simple pinnules, attached to it by their whole base, but not connate, with entire or scarcely undulate borders. The nervation is exactly as figured and described by the author. The leaflets are marked by round scars of *sori*, placed near the border, one only upon each middle vein; the details of their structure cannot be seen, but they greatly differ in form and position from those of *Alethopteris emarginata*, Gopp.

Concretions of Mazon creek; Mr. Even.

ALETHOPTERIS PENNSYLVANICA, Lesqx.

Penn. Geol. Rept., p. 864, Pl. ii, fig. 1 and 2.

In the shales of Morris; Mr. S. S. Strong.

ASTEROCARPUS GRANDIS, Sp. nov.

UPPER end of a pinna, two inches long, a little more than one inch broad at the broken base, evidently part of a large frond. The lanceolate pinna is simply divided into alternate, open, lanceolate, obtuse pinnules, one-fifth of an inch broad at their connate base, and one-half of an inch long, with a smooth surface or with merely an obscure medial nerve, without other traces of nervation. The fructification is marked by large starlike *sori*, placed near the borders of the pinnules, four on each side, one at the top, with six to ten sporange-cells pointed towards the center, obtuse to the outward. The form of the sporanges is the same as in *Asterocarpus Sternbergii*, Gopp., Foss. Farn., p. 188, pl. 6, fig. 1 and 2, but they are

larger and more distant from each other. The form of the pinna and of its division is also totally different in our species.

Mazon creek; S. S. Strong.

A number of specimens, representing fruiting pinnæ of *Pecopteris* or *Alethopteris*, have been recently obtained from Mazon creek, but are left undescribed, the essential characters, form and position of the *sori*, nervation, etc., being too obscure for a satisfactory diagnosis.

Hymenophyllites furcatus, Brgt.

Veg. Foss., p. 179, Pl. 49, fig. 4 and 5.

A few small specimens of this species have been collected by Mr. S. S. Strong, from the roof shales of Morris. It is rather a sub-conglomerate species, being found most abundant at the base of the mill-stone grit, or the top of the red sandstone, in the anthracite basin of Pennsylvania.

Stigmarioides? rugosus, Sp. nov.

As much as can be seen from two specimens obtained in concretions at Mazon creek, by Mr. S. S. Strong, the stem is cylindrical, two to three inches in diameter, marked with circular depressions, points of insertion of branches, or rootlets diverging from it all around, enlarged at base, cylindrical, flattened by compression, tapering or diminishing in size from the base, half an inch broad to the top, one-fourth of an inch in diameter, where these rootlets are broken, two and a half inches from the points of insertion. Their surface is wrinkled and narrowly striate in their length, and marked by small round holes, which appear as the basilar points of attachment of branches of rootlets. The cross section of half a cylindrical stem is obscurely seen, and appears to be marked by broad tubercles like those of a stem of a *Calamites*, only much larger. There is nothing published as yet, which can compare with these fossil remains, but the roots of *Equisetum Mougeotii*, Schp., Pal. Veg., pl. 13, fig. 9. I consider them as representing the rhizomas of some *Equisetaceæ*.

1. Odontopteris subcrenulata? Rost. Specimen No 1580 a. from Talen r of Sharp M
below Fremont has a small specimen representing a narrow linear part
of a penna with alternate basal oblique, distant, enlarged at
base with the remote by the whole truncate base with entire border or borde
slightly crenulate. The form recall the specimen described from Lorenz
f. 390 c (?) which has also distant leaflet and same veins all from
the base, their straight distant, as in O. schlotheimii but with
borders more distinctly crenulate than there. I find however in
No 1583, with a small fragment similar to that of 1580 a fragment of
pinna bearing at its base short, half round crenulate leaflet truncate at the
base attached to the rachis by wide rather half as width and with distant veins parallel
at the base and forking once or twice in the narrow & the crenate borders. The
leaflet above this and upon the same pinna become longer, lanceolate tapering
pointed, twenty one millim. long nearly eight millim. broad near the base
with its narrowed abruptly or rounded, thin leaflets having a thick flattened
decurrent midrib from which the lateral veins forking once or twice
go out in an acute angle of divergence, having the same form with also
the same nervation exactly as in Neuropteris crenulata Rost. From this it
would appear that Neuropteris crenulata Rost may be the same species as Odon-
topteris crenulata Rost. for from Lorenz specimen which can not be separated
from the leaflets just by the lower leaflet of the pinna and attached by
the whole rounded base to the rachis have the nervation of an Odontopteris, the
veins being parallel at the base and the middle vein not more distinct than
the others. These modifications seem to ally the species to Neuropteris
Asanzii and to the genus Cardiopteris of Schimper, some of the leaflets being
true Cardiopteris. See for this Schimper Terrain Jurass. de Vogesen and
his Veget. Pal. — This form positively represents the three Genera
Cardiopteris, Neuropteris and Odontopteris.

Odontopteris subcrenulata? Rost. The same as above is represented in spec. No 1621
a pinna with oblong obtusely pointed pinnules. The largest 2 cent long one
cent. broad at base or less the lower leaflet is right angle the upper ones
inclined upwards. They slightly decurrent and joined to the inferior one near
the rachis, the lower ones separated by the base which is truncate at base at the
lowest decurrent each but generally rounded in the upper basal border. The mid
rib is very distinct, the lateral veins forking once at the base and once near
the top, coming out from it and slightly curved toward the border, generally
inflated, the lowest veins only coming out of the rachis along the decurrent lower
border while in the upper basal border they pass from the mid rib close to the base of the
leaflet as marked in my figures of the U. S. Flora. Though the borders are not crenulate
or are only indistinctly so, I consider the as the same species Neuropteris or Odontopteris
crenulata. Rost as the veins are only inflated per place while at others they are thin
and evolute, this might be also a form of O. pachyderma which is however not
probable, the veins being generally clearly marked. Sp. No 1622 is a mere leaflet
of the same species, showing still more distinctly the odontopteris nervation at
the base of the lower side of the leaflet where it is more enlarged and the Neuropteris
on the other side. Spec. No 31 of Lorenz has the nervation of the species as above underlined see p. 471 c.
Odontopteris subcrenulata Rost. is not always fixed at the base of the leaflet but the
leaflets are sometimes decurrent as seen in No 1624 the lower leaflet only being borned 1623
shows the terminal leaflet very long 6 cent. lanceolate, obtusely pointed. See
Schimpers description and the specimens which I have figured of this species Pl. 24
and in 1869 the two Mare Creek there will be found more of the same character

Odontopteris & Neuropteris pachydermata form a peculiar group which might be separated without regard to the nervation which is evidently indifferent to Neuropteris and Odontopteris in the same specimen even and generally at the base of the base of the leaflet Neuropteris and Odontopteris on the lower more decurrent pod. This is seen in many Neuropteris species of Brgt. Neuropteris Duponi, Elegans, Villersi etc. These could be separated in a peculiar genus to which might be added the species which I have regarded as Lescuropteris yet unpublished and to that Pachydermata I could put Neuropteris crenulata N. Pachyderma N. acuminata, N. Agassizi etc. This all species closely allied by their unfolded lamina and disposition to pass from Neuropteris to Odontopteris in their nervation.

D1 Odontopteris Schlotheimii Brgt I have seen at Morris a pinna of the species 35 centimeters long with secondary pinnae alternate 7 ½ centimeters long open. The characters are the same in one figure of the U. S. carboniferous flora.

D2 Odontopteris Worthenii Dgn. Lacoe spec. N. 178. is a small terminal pinnule of this species I have figured it p. 532 fig 6 (on specimen 5.22 & dg 1624 for nervation outside the borders) Specimen of Lacoe 178.

3. Odontopteris Jennyana (abbreviata Stur) n. nov. Pl. fig. 2. Profoundly divided; pinnae apparently open, parallel close, alternately pinnate; pinnules distant joined to the rachis nearly by the whole base, open, (nearly in right angle to the rachis which is narrow) regularly undulately three four lobed on each with three to four obtuse short entire lobes of each side; terminal pinnule (lobe) broad entire often; median nerve thick toward the base, effacing toward the point of the pinnules; veins oblique to it, parallel, slightly curved backward, simple or forking once, equal, more distant toward the borders (when they are inflated). This species may be some peculiar variety of O. Schlotheimii somewhat like the pinnae in Goppert Germina Pl. XIV fig 3. The lobes are very short however as also the pinnules and the main rachis very narrow, comparatively others. It has also a distant likeness to O. obtusiloba Naumann as figured by Goppert Germina, same plate XIV. fig 6 the form of the pinnules being somewhat similar. The nervation is however more regularly Odontopteris in this new species than figured in that of the German author.

D2a Odontopteris Schlotheimii Brgt. I have not until now, I think remarked upon the peculiar character of the rachis of this species. It appears to have been exactly cylindrical and hollow, for it is sometimes flattened and worn, is exactly flat and regularly linear with both sides parallel. It is regularly lineate striate, quite as regularly as the leaves of some species of Cordaites and in some cases the large rachis of this fern may be taken as Cordaites. One specimen from Morris 1620c. has two fragments of rachis of this kind, one quite flat bearing alternate horizontal pinnae. It is seven millimeters broad with 2 or 3 striae nearly equal and equidistant; the other nearly two and one half centimeters broad has not any pinnae but is striate in the same way, some of the striae slightly more irregular.

D4. Odontopteris heterophylla (carruthii) Dgn. I have received Oct. 77. Jene specimens of this species from Mansfield and have figured 321, 322 & 325. These represent more leaflets however of much larger size than those of the Ills Rep't vol II. The largest leaflet is 11 cent. long, rounded at the base to a narrow point of attachment and enlarged apparently lunate on the other, from the base to the middle it is oblong, a little narrowed upwards and entire. at the middle it divides in lateral irregular lanceolate lobes obtusely pointed and turned upward and the middle part is narrowed nearly linear irregularly lobate, not more than 5 millimeters broad, the terminal lobe being comparatively very long 3 cent. narrow if not entire or slightly undulate, linear lanceolate obtusely pointed. Fig 321 is a median part of a leaflet, the upper lobate part

double as long as the 3 leaflet 325 and therefore part of a leaflet at least 20 centimeters long and four cent. broad, toward the base or the entire part, I suppose, that the form is the same as the other leaflet appear terminal. It is short, only 2½ cent long rather broad or truncate at the base, divided a little above in four lobes, varall in size and length, more or less divergent palmately and representing a hand with four fingers, the middle one longer and narrower. These pieces are far different from those of Illinois, at least in size and general outline. I believe however that they may be referred to the same species. The nervation is the same, the lateral veins forthing generally twice and distinct and [illegible] that distant 12-20 in one centimeter at the borders. (see below (2))

1. Odontopteris ~~crenata~~ obtusa Brgt. I have figured two specimens of this species. Those detached pinnae agree with Schimpers description and Brongniart figure. N° 211 is from Butts. The largest 24164 is from Mazon creek. There is still another upon shale from Morris showing the same characters and a small one per Cambridge Museum O. 411 also exactly of the same character. The plant or rather the pinnae are of hard coriaceous or subcoriaceous consistence, scarcely veined, but the surface is generally covered by a thick epidermis obliterating the veins in 24164 the nervation is quite obliterated. as it is also upon the shale of Morris, in N° 211 the nervation is clearly seen through the surface waters of Coal Spec. Ma. 359 is a large pinnae of the same species; it is evidently a coriaceous
2. Odontopteris heterophylla? as described p. 470. It seems to be a different species. The veins are thinner, not inflated, closer, and often mixed with short very numerous veins as in O. Worthenii. may be a new species.
3. Neuropteris (Odontopteris) ~~cordata~~ regularis Lx. Two good specimens from Cannelton Mo 302 A & B represent this species distinctly. Both are simple pinnae. The second, the larger one is 14 cent long, bears eleven pairs of alternate rounded oblong leaflets attached to the rachis by half their base, entire in my figure, 12 millimeters broad, 14 millimeters long, at the base gradually diminishing toward the top all separated and nearly in right angle to the rachis; without any trace of nervure. They are concave impressions representing leaves of thick substance. The other is the upper part of a smaller pinna with pinnules exactly of the same character nearly 6 cent. 8 cent. long and as broad. In none of the specimens is any trace of nervilles discernable. This is a true Odontopteris, Neuropteris Pachyderma being quite a different species. (wrong) see specimens
4. Odontopteris Britannica? Gutb. Em 15a represent the upper part of a pinna, bipinnately divided at the base, simply pinnate in the upper part. The upper leaflets are lanceolate pointed or obtuse pointed, the lower pinnae are pinnately lobed with the lobes rather obtuse like those of Odontopteris ~~obtusa~~ Brardii. Ellis in distinct N° 16 is a mere fragment of a pinna with lobes or pinnules divided to the base rounded upwards, and directed obliquely forward the point of the pinnae as in the other specimens. It seems different from O. ~~Schlotheimii~~ Brardii though the leaflet are less pointed than in O. Britannica.

2 Neuropteris orbicularis ? Bowm. Ma 191 has a small pinna 4 cent long with narrow half-round rachis bearing 3 or 4 pairs of alternate round pinnules one cent each way in diameter with an obscure flabellate nervation without traces of middle nerve. The surface is somewhat rough and the nervation indistinct. appears to be the same as that described by Buehl.

DISTRIBUTION OF THE FOSSIL FLORA OF THE ILLINOIS COAL FIELDS.

The following table enumerates all the species of fossil plants known to this time, (March, 1870,) from the Coal Measures of Illinois, and indicates the location where the specimens representing them have been found. This synopsis of the fossil flora of the Illinois coal fields may serve to elucidate the remarks which have been suggested by the study of this flora. The figures marked on the table show approximately the proportion of specimens which represent each species: 1, for example, for a species represented by less than five specimens; 12 for a species represented by one hundred or more.

List of Fossil Plants.	Duquoin.	Murphysborough.	Colchester.	Morris.	Mazon creek.	Other localities.
1. Chondrites Colletti, Lesqx.	....	....	....	....	....	Lodi, Indiana.
2. Neuropteris hirsuta, Lesqx.	2	12	4	4	12	
3. " angustifolia, Brgt.	....	....	....	....	1	
4. " fasciculata, Lesqx.	....	....	....	....	1	Neeleyville.
5. " Collinsii, Lesqx.	....	....	...	1	1	
6. " flexuosa, Brgt.	....	6	....	1	...	Alton.
7. " fimbriata, Lesqx.	....	1	....	....	1	
8. " rotundifolia, Sternb.	...	....	....	....	....	Alton and Grayville.
9. " capitata, Lesqx.	....	1	....	....	1	
10. " plicata, Sternb.	....	....	....	....	1	
11. " Loschii, Brgt.	....	2	....	....	2	Abounds at Grayville.
12. " microphylla, Brgt.	....	....	....	....	1	
13. " tenuifolia, Brgt.	....	2	2	2	2	Grayville.
14. " vermicularis, Lesqx.	....	2	....	....	2	
15. " rarinervis, Bunb.	1	4	4	6	6	
~~16.~~ " ~~Villiersii, Brgt.~~	....	1	....	....	....	
17. " Clarksoni, Lesqx.	....	....	...	....	2	
18. " inflata, Lesqx.	....	....	....	....	2	
19. " ~~coriacea, Lesqx.~~	....	....	....	....	1	
20. " heterophylla, Brgt.	....	...	....	....	....	Rock Island.
21. " Desorii, ? Lesqx.	....	....	....	....	1	Still doubtful.
22. " Evenii, Lesqx.	....	....	....	.. ..	1	
23. " verbenæfolia, Lesqx.	....	....	....	....	2	
24. " crenulata, ? Brgt.	..	....	....	....	1	
25. " pachyderma, Lesqx.	....	....	....	....	1	
26. Dictyopteris rubella, Lesq.	....	6	....	....	....	

	List of Fossil Plants.	Duquoin.	Murphysborough.	Colchester.	Morris.	Mazon Creek.	Other localities.
27.	Odontopteris Worthenii, Lesqx.	....	....	....	...	2	
28.	" heterophylla, Lesqx.	....	3	....	....	1	
29.	" subcuneata, Bunb.	....	....	....	....	1	
30.	" Bradleyi, Lesqx.	....	....	....	....	1	
31.	" Schlotheimii, Brgt.	....	....	....	4	1	
32.	" æqualis, Lesqx.	....	....	....	....	1	
33.	Alethopteris serlii, Brgt.	....	6	....	3	6	
34.	" aquilina, Brgt.	3	....	2	2	....	
35.	" Pennsylvanica, Lesqx.	....	....	....	1	....	
36	" Massillonis, Lesqx..	....	....	....	....	1	
37.	" Mazoniana, Lesqx.	....	....	....	....	3	
38.	" Owenii, Lesqx.	....	....	....	....	1?	
39.	" crenulata, Brgt.	....	....	....	....	4	
40	" hymenophylloides, Lesqx.	....	....	....	....	1	
41.	" Hallii, Lesqx.	....	....	....	....	1	
42.	" inflata, Lesqx.	....	....	....	....	1	
43.	" erosa, Gutb.	....	....	....	3	....	
44.	" cristata, Gutb.	....	....	....	1	....	
45.	" muricata, Brgt.	....	....	....	....	1	
46.	" nervosa, Brgt	....	1	....	1	1	
47.	" Plukneti, Brgt.	....	....	...	1	....	
48.	" callosa, Lesqx.	....	2	....	1	....	
49.	" spinulosa, Lesqx.	1	....	....	....	....	
50.	" falcata, Lesqx.	....	....	....	....	1	
51.	" lanceolata, Lesqx.	....	....	....	....	1	
52.	" emarginata, Gopp	....	....	....	....	2	
53.	" longifolia, Brgt.	....	....	....	....	1	
54.	" solida, Lesqx.	....	....	....	....	1	
55.	" stellata, Lesqx.	....	....	....	....	1	
56.	Callipteris Sullivanti, Lesqx.	....	....	6	8	4	
57.	Pecopteris Strongii, Lesqx.	...	....	....	3	2	
58.	" Sillimani, Brgt.	....	....	....	....	1	
59.	" squamosa, Lesqx.	....	....	2	2	2	
60.	" arguta, Brgt.	....	....	....	3	1	
61.	" Candolliana, Brgt	....	....	....	....	1	
62.	" cyathea & arborescens? Bgt	....	....	....	....	1	
63.	" aspidioides, Brgt.	....	....	....	....	1	
64.	" lepidorrhachis, Brgt.	....	....	....	....	2	
65.	" hemiteloides, Brgt.	....	....	....	....	1	
66.	" villosa, Brgt.	1	2	4	6	12	
67.	" velutina, Lesqx.	....	....	....	....	....	?
68.	" oreopteridius, Brgt.	....	1	....	3	2	
69.	" Bucklandi, Brgt.	....	....	....	....	....	Little Vermilion riv.
70.	" pteroides, Brgt.	....	....	....	....	1	
71.	" Cistii, Brgt.	....	....	....	....	1	
72.	" polymorpha, Brgt.	....	....	....	....	....	Abounds at Grayville
73.	" abbreviata, Brgt.	....	....	....	...	5	
74.	" unita, Brgt.	3	....	3	....	12	
75.	" elegans? Germ.	....	....	....	....	3	
76.	" dentata, Brgt.	...	....	....	2	2	
77.	" plumosa, Brgt.	3	...	3	6	1	
78.	" flavicans? Presl.	....	....	....	....	2	
79.	" Murrayana, Brgt.	....	....	....	....	1	
80.	" chærophylloides, Brgt.	....	....	2	2	....	
81.	" Newberri, Lesqx.	....	....	....	....	1	
82.	Asterocarpus grandis, Lesqx..	...	....	....	....	1	
83.	Staphylopteris Wortheni, Lesqx.	....	....	....	....	1	
84.	" asteroides, Lesqx.	....	....	....	1	....	
85.	" sagittatus, Lesqx.	....	....	....	....	1	

(1) Pecopteris aspera Brgt. I.S. 202 Coll. of Cambridge is a fine specimen of this species. Leaf tripinnate or paripennate; primary pinnæ in right angle somewhat distant, (three centimeter, the width of the pinnæ being a little less) linear lanceolate secondary pinnæ straight angle short 1½ cent long at the base of the primary pinna very gradually shorter towards the apex, parallel, ~~equally~~ divided the lowest in big pairs then in pairs towards the apex in five etc ended to 1. equal round lobes cut nearly to the rachis when they are connate in accurrent lobes entire; terminal pinnul broadly oval larger, nervation slightly marked except the middle vein distinct in each pinnule pinnately branches in single ~~or~~ generally ~~in pairs~~ straight ~~or near~~ ~~approaching~~ ~~furthest~~ at the base one ~~approached~~ to the other. The rachis of the pieces is rough, as described by Brgt which however figured smooth. Fig. 202 from Worms that specimen primary rachis is very buried in the stone. Another specimen ~~in~~ in the collection of Prof A. H. Worthen shows it very. The substance of the leaflets though not coriaceous is somewhat thick, the veins being buried into the epidermis.

List of Fossil Plants.	Duquoin.	Murphysborough.	Colchester.	Morris.	Mazon creek.	Other localities.
86. Sphenopteris scaberrima, Lesqx	....	....	....	1	....	
87. " gracilis, Brgt	....	....	....	3	....	
88. " mixta, Schp	....	....	....	4	....	
89. " paupercula, Lesqx	1	....	....	....	....	
90. " irregularis, Sternb	....	....	2	....	....	
91. " obtusiloba, Brgt	....	1	....	....	....	
92. " latifolia, Brgt	....	....	....	....	1	
93. " trifoliata, Brgt	....	....	2	....	....	
94. " abbreviata, Lesqx	....	....	....	....	1	
95. " elegans, Brgt	....	....	....	....	1	
96. Hymenophyllites alatus, Brgt	....	....	1	1	2	
97. " spinosus, Gopp	....	....	2	....	....	
98. " pinnatifidus, Lesqx	3	....	....	....	....	
99. " tridactylites, Brgt	....	....	....	1	2	
100. " trichomanoides, Bgt	....	....	....	1	....	
101. " myriophyllum, Brgt	....	....	....	1	....	
102. " Schlotheimii, Brgt	..	1	....	1	....	
103. " delicatulus, Brgt	....	....	....	1	....	
104. " tenuifolius, Brgt	....	....	....	1	....	
105. " splendens, Lesqx	....	....	6	6	...	
106. " furcatus, Brgt	....	....	....	1	....	
107. " hirsutus, Lesqx	..	....	....	1	....	
108. " inflatus, Lesqx	2	....	....	....	....	
109. " adnascens, Ll. & Ht.	....	....	....	2	....	
110. " lactuca, Gutb	....	....	....	....	2	
111. " arborescens, Lesqx.	....	....	....	1	...	
112. " Clarkii, Lesqx	....	....	....	....	8	
113. " Gutbierianus, Presl.	....	....	1	....	....	
114. " thallyformis, Lesqx.	....	....	1	1	....	
115 " Strongii, Lesqx	..	....	....	....	1	
116. " mollis, Lesqx	...	....	....	....	2	
117. Pachypteris gracillima, Lesqx	....	....	....	2	...	
118. Cordaites borassifolia, Ung	2	4	2	2	2	
119. " angustifolia, Lesqx	6	....	2	1	1	
120. Sphenophyllum Schlotheimii, Brgt	2	2	4	6	2	
121. " emarginatum, Brgt	2	....	2	2	2	
122. " filiculme, Lesqx	...	....	....	....	1	
123. " cornutum, Lesqx	....	....	2	1	....	
124. Annularia longifolia, ? Brgt	....	....	...	....	2	
125. " longifolia, Brgt	1	1	2	2	6	
126. " inflata, Lesqx	...	...	....	....	4	
127. " sphenophylloides, Brgt	....	2	2	3	3	
128. Asterophyllites rigidus, Brgt	....	....	....	2	2	
129. " longifolius, Gopp	....	....	....	1	...	
130. " grandis, Ll. and Hutt	....	....	....	3	...	
131. " equisetiformis, Brgt	1	....	1	2	1	
132. " sublævis, Lesqx	....	....	....	....	1	
133. " lanceolatus Lesqx	....	....	....	...	1	
134. " ovalis, Lesqx	....	....	....	2	....	
135. " foliosus, Ll. and Hutt.	....	....	....	....	4	
136. " tuberculatus, Brgt	....	....	....	2	....	
137. Equisetites occidentalis, Lesqx	....	....	....	....	1	
138. Calamites Suckowii, Brgt	....	....	...	....	2	and Carmi, abundant.
139. " ramosus, Brgt	1	2	2	2	1	
140. " cruciatus, Brgt	1	....	....	2	....	
141. " nodosus, Brgt	....	..	....	2	1	
142. " Cistii, Brgt	....	....	....	....	1	and Grayville.
143. " pachyderma, Brgt	....	...	....	....	....	?
144. " bistriatus, Lesqx	....	....	....	....	....	?

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	List of Fossil Plants.	Duquoin....	Murphysborough.	Colchester..	Morris	Mazon creek.	Other localities.
145.	Calamites approximatus, Brgt.....	1	....	1	2	1	and Carmi,
146.	" undulatus, Brgt.....	....	....	1	....	....	
147.	Artisia transversa, Sternb.....	....	....		....	1	Grayville.
148.	Selaginites uncinnatus, Lesqx.....	....	....	2	....	....	
149.	" carifolius, Lesqx.....	....	....	1	....	....	
150.	" crassus, Lesqx.....	....	....	....	....	2	
151.	Lycopodites annulariæfolius, Lesqx...	....	....	....	....	1	
152.	" Meekii, Lesqx.....	....	....	....	1	....	
153.	" asterophyllitæfolius, Lesq.	....	....	....	....	1	
154.	Schutzia bracteata, Lesqx.....	....	....	....	....	1	
155.	Lepidodendron rigens, Lesqx.....	....	....	....	....	1	
156.	" Morrisianum, Lesqx..		....	....	1	....	
157.	" forulatum, Lesqx. ...	1	....	...	....	....	
158.	" Tijoui, Lesqx.....	2	....	....	....	....	
159.	" diplotegioides, Lesqx..	....	....	1	...	....	
160.	" Worthenii, Lesqx....	....	2	....	....	....	
161.	" turbinatum, Lesqx....	....	....	....	....	....	Carol's place, Chester group.
162.	" costatum, Lesqx.....	....	....	....	....	....	
163.	" obscurum, Lesqx.....	....	....	....	....	....	
164.	" radicans, Lesqx.....	1	....	....	....	....	
165.	" simplex, Lesqx.....	....	...	2	....	....	
166.	" modulatum, Lesqx....	....	....	....	1	1	
167.	" clypeatum, Lesqx.....	....	....	....	....	...	Rock Island.
168.	" rugosum, Brgt	....	....	...	...	....	Little Vermilion.
169.	" obovatum, Sternb....	....	....	3	3	1	and Rock Island.
170.	" gracile & elegans, Brgt.	....	....	3	4	1	
171.	" Veltheimianum, Stern.	....	....	....	....	....	Chester group.
172.	" dichotomum, Sternb..	....	....	....	2	....	
173.	" mammillatum, Lesqx.	....	....	....	2	....	
174.	" cruciatum, Lesqx.....	....	....	....	1	....	
175.	" Greenii, Lesqx.....	..	....	....	...	...	Mercer county.
176.	Ulodendron majus, Ll. and Hutt	....	....	1	4	....	
177.	" ellipticum, Ll and Hutt..	....	....	3	4	....	
178.	" elongatum, Lesqx.....	....	....	....	2	....	
179.	" punctatum, Sternb.....	....	....	....	....	....	Vermilion co., Ind.
180.	Lepidophloios? auriculatum, Lesqx..	2	....	..	....	....	
181	" laricinum, Sternb....	....	....	....	3	....	
182.	" protuberans, Lesqx...	....	....	....	2	....	
183.	" obcordatum, Lesqx...	1	...	1	....	....	
184.	Lepidostrobus species.....	....	....	....	....	1	
185.	" princeps, Lesqx.....	4	....	1	1	....	
186.	" ovatifolius, Lesqx.....	....	....	....	....	2	
187.	" oblongifolius, Lesqx...	....	....	....	....	2	
188.	" hastæfolius, Lesqx.....	....	....	....	....	1	
189.	" lancifolius, Lesqx.....	....	....	....	....	1	
190.	" truncatus, Lesqx.....	....	....	....	....	1	
191.	" connivens, Lesqx.....	....	....	....	....	1	
192.	" ornatus, Brgt.....	....	....	....	....	1	
193.	Lepidophyllum lanceolatum, Brgt.....	....	....	....	2	1	
194.	" majus, Brgt.....	....	....	....	2	....	
195.	" auriculatum, Lesqx..	2	....	1	....	....	and Neelyville.
196.	" rostellatum, Lesqx...	..	....	....	....	1	
197.	" striatum, Lesqx.....	...	....	....	....	1	
198.	" foliaceum, Lesqx....	...	1	....	1	....	
199.	Knorria imbricata, Sternb and Gopp..	....	....	....	....	....	Chester group.
200.	" Selloni, Sternb.....	....	....	....	2	....	
201.	Sigillaria monostigma, Lesqx.....	...	....	3	1	...	
202.	" sculpta, Lesqx...	1	....	....	....	....	

1. Sigillaria ovoides, Brgt. from p. 483 c (3) There is some discrepancy between the species as represented here and that of Brongniart. I do not believe however that the differences are essential enough to separate the species. Brongniart's are larger, he says: cicatrices discoides latitudine costas subaequantibus. In our specimens they are scarcely half as large. But the costae are larger a difference of size of costae and of scars often remarked. In Brongniart also the vascular scars are quite near the top of the bolster while in our specimens they are rather near the middle, and both vascular lateral scars are longer, remarkably longer indeed. As we have however the same form of scars and the same kind of wrinkles, parallel to the bar, I can not see the difference of species. I found often upon large specimens a notable difference in the position of the scars and therefore take this as a mere local variety. It should however be figured.

2. Sigillaria elliptica Brgt. from p. 446 b (4) Lance specimen 706 appears to represent this species of which Brgt has three figures 1–3 pl. 152 none of which however shows the character of the decorticated surface Goldenberg represents. I also take the three figures, and one for a scar all also without decorticated surface. The species is allowed to my Sigillaria attenuata fig. 2 & 3 Pl. 2 of Cat. but has the lower angles of the scar rounded or scarcely angulate. The ribs are narrow, 1 cent broad more or less, plane or convex, (moderately) — furrow straight. Surface equidense smooth, with the intervals between and under the scars slightly wrinkled horizontally in the specimen of Lance the wrinkles are distinctly seen in the furrows with the exception especially in the upper part above the scars. Scars close & vascular scars rather distant in distance from three to seven mill, varable also in size from 7 to 9 mill. long from 4 to 5 mill broad, broader toward the bar, oblong at the top, rounded at the base either oblong or slightly angular at the lower corner with the vascular scars three, placed on the upper part near the top. The lateral ones semilunar the middle on a point (?) toward the bar of the lateral ones. Decticated surface very slightly obscurely lined the lines not perceivable to the naked eyes, decticated scar oval mamilla 0.2 mill long 1 mill in broad. This species has close relation to S. Cortei Brgt pl 147 fig 3-4 which has longer and narrower scars etc - see also S. cordi in Geinitz. Pl 8 fig 3. I consider 706 as the true specimen of Brgt.

3 Sigillaria orbicularis Brgt. Spec. 616 of Lance. Ribs flat 11 mill in broad furrow straight, narrow. Scars much smaller than the ribs, broader than long 7 millim. broad. nearly round slightly narrowed at the oblong top, rounded at base. Vascular scars three, the lateral ones semilunar the middle a point or point at the middle. Decticated surface, of the vascular scars of the same form but with out surface smooth both corticated & decticated. Distance of the scars 12 mill. Agree exactly with Brgt fig. 4 the upper description merely differing by larger scars broader ribs and greater distance. All proportionate - see p. 474 b 2.

4 Sigillaria obovata &c. Lance spec 621 c. corresponds with the species remarkable by the width of the ribs, the depth and width of the furrows. The decticated surface is obscurely lined. The half a millim thick & surface rough. See

474 bis

decorticated scar is oval small a marked = my figure of the Gen. Repul
Specimen 617 has the same in the ribs but the corticale scars are
obscure, apparently of the same form but larger as the decorticated scar
also obscure there apparently oval (a) but offer with two parallel lines
corresponding to the lateral vascular scar I have nothing similar
might be S. Bradleyi but the whole surface of the species and
its decorticated vascular scar is different perhaps. S. Bargati Bry.

The test is 1 mill thick.

D. 1. Sigillaria Bargati Bry. The above number 617 of Lacoe seems to represent the species. Ribs slightly convex 22 mill broad, furrow deep, canaliculate or sealed surface smooth. Scar as seen above (a) with decorticated scar slightly marked by a line. Both surface smooth. See 475 fig 2.

† 2 Sigillaria obscura Bry. (fig 474 a 3). I refer still to this species 616a of Lacoe which has narrower ribs and smaller scars like those of Bry. The decorticated surface is more distinctly lined or evidently so and the decorticated scar are marked by an irregular oval mamille sometimes replaced by a small groove or by a patch of coaly matte more generally the form of the corticated vascular scar is preserved (a). One specimen 621 from the same locality shows the same disposition of ribs narrower furrows, as narrow as in Bry fig. with the furrow broad and obliterated the scars slightly more elongated or rather oval than round and the corticated surface evidently and distinctly striate. The inside surface and the decorticated scar are of the same character as in 616a. Here I take a variety.

† 3 Sigillaria sp. nov. or S. tessellata Bry. Lacoe spec. 734 see also 618 Test flat rubbed. Ribs 2 cent broad flat, intermediate furrow mentaldeck a channeled two mill broad. Scars large 1 cent long and 1 cent broad at the lateral lower, the outside corners hexagonal, the upper side narrower than the others or truncate the lower truncate and the other in right line upper and lower side 5 mm broad. Lateral ones 7 or 6, all the corners angular. Lateral vascular scar (a) mucronated or transversely oval. Decorticated surface transversely wrinkled in the length or undulately irregularly striate, scars marked about like those of the corbe; cortex thin scarcely ½ mill thick. This form is more like fig 1 of my plat N 72. The scars of the same hexagonal form separated by a deep wrinkle and irregular transversal smaller lines or wrinkles which are not seen upon the specimen of that fig. 1. The scars are also more distant, lengthwise 5 mill from each other and are not more than half as broad as the ribs which or 1 cent while the ribs are 2 cent. In the fig. of my plate the scars are just as large as the ribs. and the latter has not been any trace of transversal wrinkles. I believe however that both represent the same species but that N does not represent S. tessellata but a new species.

(210) see end of this.

Sigillaria leptoderma Dryg (The name might be changed but it is appropriate).
A specimen of Lacoe 715 has the bark slightly thicker, surface of both corticated and decorticated less distinctly though evidently lined; scars still smaller 5 cent. broad at the lower corner and as long though the ribs are 2 cent large. Scars decorticated double, parallel narrow, linear oblong oblique. 4 mill long less than one mill. broad. In the middle of the ribs and in the line of the scars there is on this specimen a depression same width that of the scars as in S. marginata. Pl. 71 fig 5. which however differs by broader ribs, more elongated scars, subcortical scars as large and longer united part thicker. The relation of these two species is close. It seems however that this N. 715 should be referred to S. marginata Pl. It is described p 481 c (2) – This 715 is evidently S. marginata exactly described 481 c (2). The bark is thicker than in S. leptoderma the subcorticated scars closer and generally connected the subcorticated scars longer or indeed little differing. Both species might be one or mere var. of one. The specimens described as leptoderma being with narrower ribs being of a more recent part of the tree.

? Sigillaria laevigata, Bryt. ? Lacoe specimen 617. may be referable to the species. Ribs 2 ½ cent, furrow wide. 5 mill. broad. surface both corticated and decort. quite smooth, scars large same size and form as those figured by Brongniart, 2 cent. distant ~~decort scars~~ Cortical scars double, linear oblong joined in the middle ~~same~~ smaller than in Bryt figure Bark thick, one millimeter, not less. Much like the former species but without ~~dep~~ longitudinal depressed lines in the middle of the furrows, and with thicker bark quite smooth like the ~~recent~~ Coker surface the scars of the decorticated part are close apparently joined in the middle but the middle became remarked in Brongniart figure are not seen; or at least not very distinctly. they appear O, each joined at the top. In this as in Bryt figure the cortex bears the inflated double scars, and the subcortex the hexagonal ones. It is the contrary in the plate of Sigillaria rectiformis, or my plates or specimens also. The character if it is one might relate my fig 5 of Pl 71 A to this species. Sigillaria leptoderma

3 Sigillaria ~~rectiformis~~ Williamsii Lacoe spec. 719. Add to the description of p 446 d (2) Jessie specimen of Derby. Ribs convex half rounded slightly canaliculated lengthwise or flattened, ¾ cent broad. ~~Furrow~~ 3 mill. 1 cent. canaliculate 3 mill furrow deep narrow V carinate. Scars very small, distant – 3½ cent. in vertical order, ovate, emarginate at the top, rounded at the base 4 mill. long 3 mill. broad. Fig 2. p. 531 is good but too shallow too broad M vascular scars two linear and one pointed between. Surface rugose or wrinkled between the scars along the middle depression scarcely visible on both sides, bark thin as thin paper some surface regularly distinctly striated, the striae sharp, parallel regular, about 30 per width of ribs. vascular scar single a double small deep brown cavities. Distantly related to Sigillaria Deutschiana Bryt.

List of Fossil Plants.	Duquoin	Murphysborough	Colchester	Morris	Mazon creek.	Other localities.
203. Sigillaria Brardei, Brgt.	1	...	...	....	....	
204. " tessellata, Brgt.	....	1	....	....	....	Carmi.
205. " intermedia, Brgt.	....	....	....	....	....	"
206. " spinulosa, Germ.?	....	....	....	....	....	Marseilles, Ill.
207. " corrugata, Lesqx.	....	....	....	....	....	Big Vermilion.
208. " Massiliensis, Lesqx.	....	....	....	....	....	?
209. " Yardleyi, Lesqx.	....	....	....	....	....	
210. " reniformis, Brgt.	....	...	....	....	....	
211. " alternans, Ll. and Hutt.	....	....	....	1	....	
212. " Cistii, Brgt.	....	...	....	1	....	
213. Syringodendron pachyderma, Brgt.	....	...	....	....	....	?
214. " Porteri, Lesqx.	....	....	....	....	...	Gallatin county.
215. " pes-capreoli, Brgt.	....	....	....	....	....	Grayville.
216. " cyclostigma, Brgt.	....	....	...	....	....	Alton.
217. Sigillarioides radicans, Lesqx.	....	....	....	....	1	
218. " stellaris.	....	....	....	1	...	
219. Halonia tuberculata, Brgt.	....	....	...	....	....	Chester group.
220. Stigmaria ficoides, Brgt.	2	2	6	6	2	
221. " elliptica, Lesqx.	1	....	....	2	....	
222. " umbonata, Lesqx.	....	....	8	....	....	
223. Stigmarioides Evenii, Lesqx.	...	....	....	...	2	
224. " truncatus, Lesqx.	....	....	....	....	1	
225. " tuberosus, Lesqx.	....	....	....	....	1	
226. " villosus, Lesqx.	....	....	....	....	2	
227. " linearis, Lesqx.	....	....	....	....	1	
228. " affinis, Lesqx.	....	....	....	....	1	
229. " selago, Lesqx.	....	....	....	....	1	
230. " rugosus, Lesqx.	....	....	....	....	1	
231. Pinnularia capillacea, Ll. and Hutt.	2	2	4	4	....	
232. Megaphytum protuberans, Lesqx.	....	....	....	....	....	Chester group.
233. " McLayi, Lesqx.	2	....	....	....	1	
234. Caulopteris insignis, Lesqx.	1	....	....	....	....	
235. " Worthenii, Lesqx.	....	....	...	....	....	Carmi, White co.
236. " obtecta, Lesqx.	....	....	6	4	....	
237. " intermedia, Lesqx.	...	....	...	....	....	Fulton county.
238. " acantophora, Lesqx.	....	....	8	2	....	
239. Trigonocarpum Nœggerathii, Ll. & Ht.	....	...	....	....	1	[co., Ind.
240. " olivæformis, Ll. & Ht.	....	....	....	....	....	Eugene, Vermilion
241. " juglans, Lesqx.	....	1	....	....	....	
242. " rostellatum, Lesqx.	....	....	....	....	....	Grayville.
243. Rhabdocarpus clavatus, Sternb.	....	....	....	....	1	
244. " mammillatus, Lesqx.	....	....	....	....	1	
245. Carpolithes multi-striatus, Sternb.	....	....	8	3	1	
246. " Jacksonensis, Lesqx.	...	2	....	....	1	
247. " cistula, Lesqx.	....	1	...	....	....	
248. " fasciculatus, Lesqx.	....	....	....	....	....	Grayville.
249. " corticosus, Lesqx.	....	....	....	....	1	
250. " persicaria, Lesqx.	....	1	....	....	....	
251. " vesicularis, Lesqx.	....	1	....	2	...	
252. " bullatus, Lesqx.	....	....	....	..	1	
253. Sigillaria semina?	....	....	....	1	1	
254. Palæoxyris Prendeli, Lesqx.	....	....	....	....	2	
245. " appendiculata, Lesqx.	....	....	....	..	1	
256. " corrugata, Lesqx.	....	....	....	...	1	

This table enumerates 256 species of fossil plants, or more than double the number of those which were known from Illinois at the time when the second volume of the State Geological Report was published. The catalogue of the American fossil plants which served as a point of comparison for the table prepared for that volume, p. 464, enumerates 280 species, (~~120 from Illinois~~) even comprising some pertaining to the Devonian strata. It is, therefore, evident that the assertion, concerning the insufficiency of our knowledge of the flora of the Coal Measures of Illinois and of the future discoveries promised to continued researches, is fully corroborated by facts. Of the recently discovered species, seventy-nine are considered as new, and forty, though known already from Europe, had not been recognized before in our American Coal Measures.

The species marked in the table as from Morris and from Mazon creek, are from the same geological horizon. The bed of shale overlaying the coal at Morris covers, apparently, the whole extent of the Coal Measures of Grundy county. At Morris, this shale contains but few nodules or concretions, while at Mazon creek these nodules are found quite abundant, having been washed from the shales into the bed of the creek. The two localities are separated in the table merely to indicate the proportion of species preserved in shale or in concretions, and to show the difference in the nature of the fossil remains. About 180 of the species enumerated in the table have been found at Morris and Mazon creek. This remarkable predominance is due to peculiar circumstances:

1st. It is at and around Morris that an uninterrupted series of researches has been pursued by the two ardent and clever investigators, Messrs. Jos. Even and S. S. Strong, so often named in this Report. Researches of this kind, in which the miners often become interested and afford valuable assistance, offer the best chances to make new discoveries. They also enable the observer to obtain, when still in place and before the fragments are scattered, specimens of the different parts of a plant; to compare the different organs, or the same organs in different positions, and thus to become better acquainted with the true nature, and with the variations of forms of the same vegetable.

2d. In the shale of Morris, there is not only a great abundance of remains of plants, but the coal which it covers is opened either by shafts, or by drifting at numerous and distant places, and therefore the flora is exposed in its local varieties. The distribution of plants in the coal epoch was evidently governed by the same laws as is now the vegetation of our swamps. There was a general uniformity of species, with a constant diversity of groups on small areas. As we see now in the peat bogs, here the ferns, there the grasses, or the rushes or the mosses, according to the degree of humidity of the surface, which varies at every step, we find, in examining the fossil plants of a given area, a con-

Questions to be treated in the Flora of the Coal flore. Leo p 511. 476 6.

1- History of the coal, its discovery, its exploitation, its progress in the various basins.

2. What are the Carboniferous measures. Where is the lowest coal. where is the upper.

3 Distribution & ecological of the coal measures in different states. Trip Hazen.

4 Extent of surface occupied by . 4 . 4

5 Relation of plant to the different Stages. How far it may be admitted. as Characteristic of the essential character of Each stage.

The purpose of this work is not to scientifically examine difficult and unsettled questions of vegetable paleontology of the coal, to go by long researches the character of the genera division, of their relation to Cryptogams etc. but to represent the flora as it is seen everywhere in the N. American coal basin and to give representative and descriptive of those fine materials, vegetable remains found everywhere around us. The coal is one of the most important indeed the most important mineral products of the Continent. The coal fields are of immense extent, the coal measures of great thickness and not only the intrinsical value of the coal but its nature, its composition will be constantly and more and more studied and the questions to after progress now on the character of its plants will become more pressing. This work is therefore intended as an answer to all the questions which may be made by those interested in fossil botany in regard to the species and relations of the fragment which the measures the progress &c may from time to time gather & collect either purely for mere ornament or for study by individuals of the science. It has therefore to give an exposition of all what has been seen and published upto till now upon the coal plants or the vegetable of the coal. Even that not all the species can be yet represented in figures. Though this would have been very advisable for they are published already, many of them the books where they are found described and figured are rare and can not be obtained at any price. (see our day Where the plants (american) have been described

Asterophyllites (Calamodactus) grandis Hern. The specimen which I refer to this species are numerous enough, but not easily distinguished from A. equisetiformis. It differs by narrower nearly linear leaflets, more open slightly curved up and a slightly marked mid rib. The stem are more evidently striat than in A. equisetiformis and the internodi longer, about as long as the leaves.

stant recurrence of the same species at the same place, and a diversity only at a distance in various directions.

At Mazon creek, the meanders of the stream have dug a broad bed through the same bank of shale, and the water, washing for centuries, has uncovered great numbers of concretions and scattered them for miles from their point of origin. As a whole, therefore, the concretions represent the characters of the flora of a large area. No other place in the Illinois coal field has afforded the same advantages for research.

The shales at Colchester, Murphysborough and St. Johns, are rich in vegetable remains; but little has been done there in the way of collecting specimens of fossil plants, except by the assistants in the Survey. And from the above remarks it is easy to understand that researches made in passing, or remaining at a place only for a short time, are far from affording the chances of valuable discoveries. It is, therefore, very probable, that these last named localities have still in reservation a good many species of coal plants which are now unknown to us, and that the fossil flora of Illinois is far from being fully known at the present time.

The Report on the Flora of the Coal Measures of Illinois should have been closed here, but for the recent publication of a remarkable work on vegetable palæontology. (1) Among other matters of general interest, this work is prefaced by some discussions on the cause and nature of phenomena attending the preservation or fossilization of vegetable remains. It also describes and critically reviews most of our new species published in the 2d vol. of the Ills. Geol. Report. This, of course, is a reason for considering, from American observations, some well established facts which corroborate or invalidate the conclusions of the celebrated author. It also provokes a discussion on the value of some of our species, and on their affinity with the flora of the Carboniferous Measures of Europe. And further, it now becomes of importance to review the conclusions which have already, or should be hereafter drawn, on the geographical and stratigraphical distribution of our species of fossil plants in relation to geology, and to fix some reliable points of reference for future researches on the subject.

(1) Traite de Paleontologie vegetale par W. Ph. Schimper. Paris, Bailliere & fils, 1869.

MODE OF PRESERVATION OF VEGETABLE REMAINS IN OUR AMERICAN COAL MEASURES.

§ 1st. REMAINS OF PLANTS IN COAL.

It has been erroneously asserted that the coal itself does not contain any recognizable vegetable remains, it being merely a mass of bitumen, independent of any of the plants which are found in the shales overlaying or underlaying it. Our bituminous coal is generally a compound of supposed layers of crystalline matter, about one-eighth of an inch in thickness, separated by a thin coat of pulverulent coal, or mineral charcoal, which is a mere compound of cellular tissue and of vessels of plants. (2)

Generally, this agglomeration of broken tissue preserves some outline by which the genera, even the species to which the remains belong, can be recognized at first sight: leaflets of ferns, stems of *Calamites*, bark of *Stigmaria*, *Lepidodendron*, etc. But besides this, the coal itself, though more rarely, is marked with distinct prints of the plants of which it is a compound. This case is especially observable in a kind of hard, laminated, flint coal, obtained in Mercer county by Mr. H. A. Green, which bears on the horizontal surface of its crystalline lamellæ, however thin they may be cut, the outline and nervation of leaves and branches of ferns, and other vegetables of the coal; and these are so distinctly marked, that the most delicate parts are as easily identified as those of plants preserved in shales.

The great abundance of these remains show that the whole mass of this coal, which is true coal and burns freely, is a compound of them. In the cannel coal which has been formed under water from more decomposed vegetables, the forms are more rarely recognizable. Yet the cannel coal of Breckenridge, Ky., is marked through its whole mass by stems and leaves of *Stigmaria* and *Lepidodendron*, rendered distinct by infiltration of sulphuret of iron. Even in the anthracite coal of Penna., whose matter has been subjected to heat and

(2) This fact is easily ascertained by microscopical examination. Prof. J. W. Dawson, of Montreal, has closely examined this charcoal, and published, as results of his interesting researches, numerous forms of vessels of plants. The same kind of researches had been already pursued by Prof. Goppert, who had recognized, in this pulverulent coal, remains of plants of every family hitherto known to occur fossil in the coal. (Quat. Geol. Jour., vol. 5, mem., p. 17.)

Nu

1. Cordaites Noeggerathia a grand-fere ~~Cordaites spec nov (Calatole)~~ Leaves large, narrowed to the point of attachment where they measure only 6 millim. broad. rapidly enlarging upward so that the base already three and an half cent broad at 4 cent. from the base and at 30 cent. measuring 9 to 10 cent across diverging upward in lacinia (41) of equal width two and an half cent broad apparently divergent also for the after their separation. The largest leaf is entire to about 26 cent. from its base (L. 140.); the leaf appear thick distinctly veined, the primary veins separated by one or two ~~three~~ very thin veinlets which sometimes are not visible at all, then the veins appear 4 to 6-8½ primary see 538 in two millimeters distance, the furrow between them being also obtuse or convex. There is no trace of cross veinlets as in C principalis. One of the leaves, the largest one L 140 is crowned in the upper part with round or oval spots either convex or concave, which evidently represent epiphyllae or rather the spirobis carbonarius. The forms are merely impressed upon the leaves which are thick and coriaceous. The veins are also not regular across upon their backs as marked in Noeggerathia Beinertiana Göpp. as figured by Geinitz Pl XXI fig 18 A ~~are~~ especially as figured by Göpp. in his Gattungen V. VI, p 108 Pl XII fig 2. which by description however does not agree with these leaves of ours as the specimen 14 a. is lacinat in the upper part. It is also not apparent that the leaves a pinch are surrounding or half embracing. They are narrowed to the base which in all the specimens, (2 var. two shown) the base is apparently truncat. The veins are rather simple sometimes separated by one or two obscure veinlets especially toward the base of the leaves when they become more distant and alternately thicker and thinner or alternately thickened. It may be N. Beinertiana as Göppert may have seen only a small leaves. Of the specimens of Lacoe one only is larger and show the upper part lacinat, the others are smaller of the same size as that of Göppert but the top of the small ones is broken or destroyed. Noeggerathia Beinertiana is not mentioned by Schimper who rather confuses than clears the subject of N. & Cordaites. — I have picked out the last box of specimens of M. Lacoe and there found large and numerous fine specimens of the species which does not appear to have been described. His N 456 represent nearly a whole leaf whose base only is broken. Counting from its true base, as seen from another leaf N 330, it is 36 to 38 cent long gradually enlarging upward to its rounded top where it is 16 ~~nearly~~ cent wide cut into four or five lacinia or split, the lacinia either separated or connected merely marked by a line of division passing down 4 to 8 cent. In all these leaves the nerves are more distinct toward the base very thin and becoming obsolet in the upper part. Two other leaves have also been preserved. It is no more than 6 to 9 millimeters broad. flattened, as if it was broken from a long petiole. Indeed one of the specimen 331 bears the concave print of a long linear stem ~~thickened~~ tapering in the length with a sems embracing base. ~~eight~~ eight millim. broad. 17 cent long to the point where it is broken which seems to belong to the same leaf or leaves of this species covering both sides of the specimen. If this stem was that of these large leaves they should be considered as floating leaves. One of the smallest leaves preserved in its integrity is 32 cent long; 6 millim at its base which is truncate 15 ~~cent~~ centimeter broad at the top which is a small half round undulat and more or less distinctly lacinat. The same specimens bear also boundance of the fruit figured for them in the conglomerat mentioned, especially the Sporocarpus nucleus and the small cardiocarpi and carpolithes reticulatus etc. Leaf of specimen 331 is also 32 cent long rapidly widened to 28 cent. below its rounded top.

Noeggerathia species Im 35a. Two specimen fragments of leaves apparently referable to the species by the enlarging of the leaves upward, the largest of them fragment 11 (eleven) cent. long being seventeen millimeters broad at the base and forty five at the top. The nervation is that of a cordaites. The primary veins are shown in the middle part of the

1. Cordaites borassifolia. Specimen M. 90 pr the leaves and another with racemes of flowers as figured. The characters indicated for the nervation of these leaves p. 360 & 361 are right. The distance of the nerves in the middle of the leaves averages 16 in 5 mill or a little more than three in one millim. towards the borders the average about 20. or four in one millim. In all the cordaites the veins are closer towards the borders. They are round obtuse not as sharp and narrow as in the following species. The length of the leaves as seen upon a specimen broken in two is 43 cent. The top being gradually narrow to an obtuse point which is split in lacinias in one specimen [illegible] also split downward in the middle to 5 cent down from the point. The base half embracing and semi-lunar (meaning 13 millimeters broad nearly.

2. — (from the page). The leaves, deeply marked, the intervals convey or carinat one millimeter apart with four distinct intermediat veinlets. On the borders of the leaves, as in Cordaites the veins become flat and less distinct and also somewhat closer to each others. The nervation agree with that of Cordaites principalis as figured by Geinitz but no trace of cross veines are remarked.

†1a. Cordaites Borassifolia. One leaf perfectly entirely preserved No 158 in the collection has the base and nervation like that of my figure, extremely thin and narrow but is only 25 cent long gradually enlarging towards the middle to 4½ cent and gradually narrowing to an obtuse point. ✓39 meaning 17 cent broad

†2. (Cordaites ? Poacites Phyllum, Geinitz) No 159 Stem about 7 centimeters very large broad convex by compression forty cent. long. apparently covered or embedded the base part covered by appressed narrow leaves 4 mill. wide whose length can not be seen as they appear as superposed upon each others and very thinly striated so that the base of the leaves are not discernible. The leaves are attached only on one side of the stem and all along it, close, decurrent and imbricated at the base, from their inclined direction on an angle of 70° to the stem linear rebounded narrow, Decreasing from a base of attachment to about 15 millimeters forming a long lateral lacinia applied to the stem and in this way it is formed the appearance of a stem covered with leaves as mentioned here. The length of the leaves appear to have been very great. but none is preserved in the whole fragment measure from point of attachment 30 cent to the border of the specimen where they are broken. The nervation of these leaves is peculiar extremely thin, veins to the and close that on apt near the base of the leaves they are undistinguishable with the glass, [illegible] 5 millimeters a four per millimeter. The leaves are not thin. The epidermis being somewhat thick but the veins are not more marked on the surface above than below the epidermis. The leaves have been placed very close and imbricate 30 to 40 in a length of 30 centimeters along the stem. I have a specimen of this but small. See p 479 a 1.

3. Cordaites. Mansfield. See figure of the specimen N° 148. There is a fine branch of this species whose diameter is only 4 millimeter. The leaves are very oblique as upon the large stem, seems to the slightly narrowed middle base which is rounded both sides so that they appear slightly auriculat on the lower side about as in this sketch. The characters are indicated as But the stem is covered by a somewhat thick coat which when taken out leaves the surface as marked by cross ridges [illegible] This specimen not separable to this as also the one counterpart of my own N° number 160. On the small stems the leaves are semi-embracing. I see them slightly auriculate only at the borders of the large stems.

1 Artisia sternbergi or Sternbergia approximata ?. Smith collection has three specimens Im 49. One of them the largest is 23 cent. long, 4 cent. diameter, slightly flattened, the mould with horizontal ribs or striae covered with a layer of earth transformed into coal two millim. thick with smooth surface. a fine specimen. the ribs are not perceptible upon the coal-bark.

2 Cordaites (Dadoxylon) Mansfeldi (Dadoxylon) n. sp. Mansfeld a large specimen representing still another species apparently of the same type as N 159. vide above p. 478 b (2). This one has the trunk or branch also marked only by fragments of leaves, mixed with appressed leaves, 6 cent. cent. broad. Leaves much narrower than in N 159 4 to 6 millim. only, slightly enlarged above and then narrowed to the point of attachement with the peg, or the margin; very narrowly thinly and obscurely striate, still more indistinctly than in the specimen 159. They do not curve backward the stem as in 159 but are very oblique to it as in the C. mansfeldi and directly attached to it by the sub amplectent base. See p. 539. (1)

3 Dicranophyllum (Dadoxylon) contortum. Grand'Eury or Dicranophyllum specimen of Ma. 162. The stem seems a compound of narrow leaves twisted together and diverging from the stem either irregularly in bundles of three a piece or more regularly toward the upper part in single leaves close parallel divaricated lacerate; all linear, leaves and leaves two to three millimeters broad very thinly lineato veined, the veins very thin and more distant however than in the former specimen 161. at least when the heavy coating of waxy matter is out of the surface. These leaves closely resemble those of Grand'Eury published as Dicranophyllum? (sic) Another specimen which seems to represent a bundle of three leaves separating and curving (twisted) are a compound of very thin filament or nerves without denticulations or separations toward the point marked by a pencil by a hairy tuberosity of these veins. The sketch here is very small compared to the specimen. See correction p. 535 (6.)

1 a. Artisia transversa or A. Sternbergi at least one specimen of this kind belongs positively to Cordaites. Mansfeld has a number of them in connection with C. Cordaites the stems ranging in diameter from 1 p. t. 2 p. cent. across. The smallest of these stems seems to be continuous upwards by or into a leaf of cordaites, which is perhaps only the bark marked across only. It is however flattened in coming out from under the fragment of stem. The branches are all short rounded on one end, flattened on the other, perhaps representing short branches lateral and deciduous to which were attached a tuft of leaves. 2 handsome specimen, that small remarked above. The horizontal striae are deep and irregular, cut by irregular vertical cuts. The cortex is smooth. When present the horizontal striae are not marked but the surface is vertically thinly nerved by the leaves of Cordaites. One of the specimens is flattened and resembles a long linear leaf striated across like the sphenophyllum. Ma 22 cent. long 12 millim. broad, perfectly linear equal in the middle flattened on the border marked across with equal ribs or wrinkles 1 p. millim. broad but not quite or always continuous some of them breathing in the middle; all disappearing at the border.

(4) Cordaites Mansfeldi. There a specimen of a thin branch which explains the appearance of the stem as largely striate. This is formed by an inflated at the insertion by an enlargement of the leaves. See it. I have found one of the leaves in its whole length, it measure 24 cent.

5 Cordaites (Dadoxylon) costatus n. sp. Ma 329. A branch one and an half cent. broad deeply marked or irregularly costate by the inflated and elongated base of the leaves, leaves linear slightly enlarging upwards 5 millimetres broad toward the base 8 to 10 millimetres broad in the upper part, distinctly nerved. Primary nerves

somewhat variable in the lanes, wider in the middle of the bars averaging 3 in two millimeters, separated by 4 to 5 very thin veinlets, cut by very thin cross wrinkles. Flowers in one sided decurved racemes somewhat thick, hard, ~~apparently from the ends of the leaves~~, more or less ~~interrupted~~ on one side below the point of attachment of the flowers; flowers ovate oblong compound of approved narrow linear lanceolate acuminate scales as seen fig. 2. Compare difference with those specimen No 2 of Merrifield and of that of Clinton. See comparison and reflection p. 534 (2)

1. Cordaites ~~Dawsonophyllum~~ decurrens; from p. 478b 2. I have another very large specimen of this species apparently Ma 305 in this the stem or trunk is fifteen cent. broad convex covered on one side by the decurring base of the leaves but naked or deprived of its bark in the largest part of it. On the naked part the bases and point of attachement of the leaves is marked by a linear manilla convex, wounded at base little more than 1 millim. broad, gradually diminishing upwards and flattening to ~~one~~ 1½ or 2 cent. from the base where it gradually disappears on the border the decurrent part of the leave are imbricated forming a thick base at least 1 millim. thick, transformed into coal and the leaves passing outside or an open angle of divergence from the stem are crowded and their width scarcely ascertainable. They are thick with a shining surface and the nerves equal and so thin that they are scarcely discernable with a strong glass. This species is of a same group as the following see p. 533, (5)

2 Cordaites ~~Dawsonophyllum~~ flexuosus No. 307. Stem or branch narrow. 1½ cent broad flattened by compression irregularly obscurely striate base crowded sessile semi-embracing, ~~superficial~~ linear very long nearly in right angle to the stem; 1 cent broad 37 cent. long as far as they can be seen upon the specimen where the end of none of them can be seen: but as semi opaque veins extremely thin and close at least 18 to 20 in one millimeter, reticulated or wrinkled across; so that the surface appears under the glass somewhat rough. This species differs from the former by the surface of the base not smooth, by their base not decurrent by the veins all of the same size and doubly more crowded or close to each other; in both the surface is wrinkled across however. The species represented by specimen ~~164~~, ~~152~~, ~~179~~, ~~201~~ A 307 represent evidently a peculiar and separate group of the cordaites far different of that with leaves ~~that a distinctly veined~~ see for comparison p. 534 (4)

3 Cordaites ~~Dawsonophyllum~~ ~~Dawsonophyllum~~ fasciculatum sp. nov. Mo 258. To this group may be added also this form which is figured. It is a branch 12 millimeters broad irregularly costate in the length, smooth leaves either simple, half embracing or fasciculate, grouped three or four together from a common point of attachement resembling articulation. The bases are linear but narrower at the point of attachement where they measure 2 to 3 millimeters and gradually becoming broader 8 to 10 millimeters at a distance from 8 to 10 centimeters from the point of attachement where the specimen is broken. Their full length can not be ascertained. The veins are as in the former species about 20 in 1 millimeter all equal and crossed by cross wrinkles. See ~~p. 480~~ 533 (8) (p. 536 (8)) Cordaites t. 498.

fused to cohesion after the transformation of vegetable matter into coal, one can easily discover an abundance of remains of plants whose genera and even species are sometimes recognizable. These facts, which cannot be overlooked, may be taken into account in examining new theories in relation to the formation of coal.

§ 2. VEGETABLE REMAINS PRESERVED IN SHALE.

It is in the clay or silicious shale that the fragments of plants of the coal epoch have been more generally preserved. When a bed of vegetable matter heaped for the formation of a coal has begun to cease its growth, its top indicates a greater scarcity of vegetable remains, mixed with a larger proportion of earthy or clayey matter. The coal then becomes a less homogeneous mass, easily separating in layers of heaped fragments of vegetable and foreign matter. By and by, the vegetation becoming scarcer by superabundance of water upon the surface of the bogs, the clay is more thickly deposited, and the vegetable remains, more rare and scattered, are more distinct and more easily recognizable. When preserved in that way, the plants or their fragments have been first slowly decomposed and softened by humidity, and then more or less flattened by compression. All the naturalists who have examined the coal formations are well acquainted with the appearance of the remains found in shale, and sometimes admirably preserved. Generally, the woody tissue of the plant has been destroyed, and the surface of the stems and branches only are preserved in a thin coat of coaly matter, bearing impressions of scars of the bark, etc. For the leaves, the coaly matter represents the whole substance, and for the ferns, especially, it preserves the exact form of the vegetable and is marked by the impression of veins and veinlets, mostly distinct to their last divisions. Some leaves of a coriaceous texture have their epidermis hardened by mineralization, and separable from the shale like a transparent pellicle. It can then be easily examined under the microscope, and all the details of structure recognized. It is especially the case with our *Dictyopteris rubella* of Murphysborough, as also with the leaves of *Whittleseya elegans*, Newb., of Ohio. Sometimes the leaves of *Neuropteris hirsuta* have been heaped and compressed together in such quantity, that the pinnules are separable from each other as a carbonaceous cuticle, preserving traces of the primitive organism.

The shales, according to the amount of vegetable matter mixed in them, and the depth at which they have been formed under water, are of a more or less dark color; whitish or yellowish when of fresh water origin, and with few remains of plants; black and generally more homogeneous when formed in deep

water, and having for a larger proportion of their compound, broken remains of organized beings. In this case the remains are either animal or vegetable mixed together, both fragments of moluscs and fishes with fragments of plants recognizable on the same piece of shale, or mere remains of animals or only plants. These various appearances are easily explained in considering the phenomena accompanying the formation of tha coal strata, from deposits analogous to those of our existing peat bogs. For the surface of these bogs, even in our time, shows the same differences in the superposed deposits, according to the depth and chemical compounds of the water by which they become covered, either by casual inundation in the interior of the land, or by slow immersion near the borders of lakes or sea shores. Even where the coal and shales, from the amount of remains of fishes which they contain, appear to have been formed in water of a certain depth, the matter always bears evident traces of its origin from land vegetation, and never from marine plants. The lower part of a bed of coal, worked near the mouth of Yellow creek, Ohio, is a kind of cannel coal, or very bituminous compact shale, full of the remains of fishes, whose entire skeletons vary in length from one inch to one foot. Yet this shale has an abundance of the remains of land plants mixed in its compound. The same case is observable in Kentucky—for example, at Airdrie, on Green river, where the upper coal (No. 11 of the Kentucky section,) is overlaid by a bituminous laminated shale, containing teeth of large fishes with trunks of *Sigillaria*, *Lepidodendron*, etc., and branches and leaves of ferns. Those who have examined our immersed peat bogs along the shores of New Jersey, have seen in activity a formation of the same kind, where logs of large trees are fished from a depth of ten or fifteen feet, out of beds of peat submerged in water deep enough to feed a variety of fishes; while here and there, small islands, half floating fragments of wood or heaps of mud, are covered with a luxuriant growth of ferns, reeds or bushes, which throw their debris to the surface, to be conveyed to the bottom and there mixed in the bed of mud, an incipient shale, with animal remains.

Among the various metamorphoses to which remains of plants have been subjected in the shale by compression, decomposition and other chemical and mechanical agencies, one peculiar phenomenon is worth noticing here. In the shale covering the bed of anthracite of Rhode Island, the whole carbonaceous matter of the plants has been destroyed by heat, and the mere skeleton of the leaves and other remains is marked upon the shale as a more or less distinct mould, often covered by a whitish incrustation of selenite. In this process of fusion, the vegetable fragments have been distorted in such a way that they often present an appearance far different from that of the species to which they belong. For example, in some branches of ferns, the leaflets have been, on one side of the pinnæ, extended to double their original length, and narrowed

1. Sigillaria mamillaris? Brgt. A number of fine specimens of Lacoe 475 figure 464 & 474 answer to this species as figured by Weiss. As seen from the figure 5 pl 25a the cicatrices are very variable, either for their distance or for their form; at least being in the lower part of the figure more enlarged and nearly round and oval elongated in the upper part. The different scars in the middle forming an interruption like that of fig. 3 S. tenellata much resemble a cicatrix of Brgt. S. Knorri. Pl 22a 162 fig 6. Happears to be the same for S. mamillaris as figured by Weiss, has the cicatrices with obtuse base, some nearly round other oval like ones; while in Brgt they are mostly angular. These shows that the scars are very variable indeed more so than are those of S. dendroides. The same difference is manifested in S. tenellata and indeed. Considering merely the form of the cicatrices and not their size this species is very like S. mamillaris as figured. The lower part of the fig. of Sigillaria attenuata Lyq. Cal fig. 1 perhaps 2. which Schimpers refers to S. decaisnei has the scars as the one here figured. Fig. 2 has the scars far more distant. But in specimen where figured in part the scars are generally quite close as in the fig. However are separated by three millim spaces. The same difference may be remarked upon Weiss' specimens or figures. See p

Sigillaria Tabzii. Goep. Given specimen of Lacoe pl. XXV fig. 6. & 494 the species appears identical. The ribs in the two specimens are only somewhat broader the scars corresponding a little larger; but I consider the characters identical. The scars are also somewhat more obtuse at the base. But most of our specimens of American Sigillaria have the scars more obtuse than the analogous or identical European species.

9. Sigillaria tessellata. Spec. nov. Plate see 480 b (Protostigma tessellaroides) Lacoe Museum No. 461, 470, 472 & 478.

1. Sigillaria Lacoei. Sp. nov. Bark very thick 2 & 4 millimeters in the lower accordingly to the width of the ribs. Ribs one and a half to two and an half centimeters broad. convex, separated by a deep furrow marked in the height and in the middle of the ribs by a concave longitudinal groove in the middle of which are marked the elongated rhomboid scars with cicatrix with two opposite semilunar scars in the middle half enclosing an obscure point (Pl XXV d. fig. III (461). The cicatrices are distant not quite four centimeters in the large ribbed specimens; five and one half in the narrow ribbed ones. The cortex transformed into compact anthracite coal has its surface smooth except inside of the medial longitudinal groove where it is irregularly striate. (see figure). In the decorticated state, the ribs are nearly flat, regularly obscurely narrowly lined or very narrowly striated the scars Cicatrices marked by a long linear or lanceolate obtuse at the lower part gradually narrowed to an obtuse point, about 8 millim. long and 1½ millim broad in the large ribbed specimens. In the narrow ribbed ones the cicatrix is marked by a mere linear very narrow needle form projection in the middle of a depression 3 & 4 millim. long and no more than half a millimeter broad. I find no relation whatever to the species. In the decorticated state it resembles S. Cordaiana, with the surface of the ribs less distinctly striate. See p 482a 4

Sigillaria lepidodermis Spec. nov. Lacoe spec. 497. Bark flat, 1 per cent broad with the surface narrowly lineate as well corticated as decorticated, more regular in decorticated state. Cortex very thin not thicker than strong paper. Cicatrices small, elongated slightly emarginate at the upper end enlarging to below the middle rounded at the lower end 5 millim broad in the middle and 16 millim long, comparatively very distant, 1 cent or more. Decorticated cicatrices double, half cylindrical, linear lanceolate, parallel somewhat distant broader and round at the base. This species is by its small surface scars the large double subcortical one, striated surface, of the cortex of the stem form Thomas

1806 the subcortical scar distant from it the broadly oval and irregular rows. Here is an important difference in the very thin cortical scaly surface. Another specimen described N 467 has the ribs twice as broad and the double scarlike or bolster as the smaller not large. There is still a difference between S. ventricosa whose cicatrices are wider and much larger than these corticated. See p 1826-7.

A Sigillaria Pittsburgensis Sp. nov. (name may be changed) Leave specimen 481, 471, 462, 469. Deeply ribbed. Ribs flat at the surface, 15 to 17 millimeters broad, separated by a deep furrow, rounded at the borders, all of the same width, at least no variety remarked in the large specimen, where we have, surface of the ribs flat minutely irregularly lineal scars all at the same distance, a little more than two centimeters from center to center, comparatively small seven to eight millimeters long four millimeters broad nearly exactly oval, truncate or slightly emarginate at the upper end - vascular point in the middle, between two semilunar appendages disconnected at both ends. Bark two and one half millimeters thick. Decorticated surface more obscurely and irregularly lineate, mostly with one or two well marked lines and the others obsolete subcortical scar a small double crescentic papillae, one and one half to two millimeters long and scarcely one millimeters broad. This species see fig 81 XXV. a fig 4. is very closely allied to S. rugosa Brgt. pl. 81 144 fig 2 which has also a thick bark, flat ribs separated by deep furrows and cicatrices nearly of the same form. It differs by the surface which is not rugose, the cicatrices smaller expanded in the decorticated bark and the less evidently striate surface of the decorticated bark.

D2 Sigillaria Sillimanni? Brgt Leave spec. 460, 465, 615 Ribs narrow convex seven to nine millimeters broad, the costae either slightly undulate or straight scars three to four centimeters distant oval oblong thickly emarginate at the upper end rounded at the base with the lateral borders either nearly parallel as in fig 8 R. 25 a or (omitted figure) gradually enlarging toward the lower rounded end as in f. 2. 6. 25 c. The surface is slightly rugose above and below the scars in the last specimen, while in the other the whole surface is marked by a point just above the notch as in the fig of this species in Goldenberg. The point is however very small often imperceptible. The decorticated surface is marked by double small papillae or not larger than in the former species but double and parallel and prominent in the middle by a pore. Both surfaces are sometimes slightly lineate or narrowly striate. but cicatricated generally smooth as grumbled above and below the cicatrices except in the corticated bark where it is lineate as far as I have seen it. Differs essentially and greatly from the former by the thin bark, the distant lineate ribs, while the lower surface scars are closely but very thin and united at the base in a V. The scars are smaller, more oval, more regularly emarginate, the lower lateral appendages [illegible] The specimen 615 & 615 b of Leave show the species just as described by Goldenberg with a large round point at the top or above the scar. with two however somewhat longer and narrower, common at Pittsburgh.

1. Sigillaria multiplicata specimen (or another name) Pl. XXXV bis 1. Same specimen 466. Surface undistinctly costate and quite flat, the costae marked merely by obscure lines sometimes marked by a narrow and shallow furrow, & the place not marked at all. Costae 1 centimeter broad. Cicatrices one and an half centimeters distant, nearly exactly ovate, the upper end narrowed to about 2 millimeters broad and obtuse or slightly truncate, the lower enlarged and rounded. Vascular scar placed near the upper end in the form of a horse shoe with a deep point in the middle. The space between the cicatrices is transversally irregularly and minutely reticulate or smooth, while the decorticated surface or the cortex still less marked or rather not at all marked. The surface regularly deeply lineat with parallel close lines, 4 in one millimeter width. The vascular scars an oval papilla or small oval tubercle two and an half millimeters long and less than one millimeter broad. This specimen present a very remarkable composition, it being formed of seven successive layers of bark, each just one millimeter thick, the upper ones with distinct well preserved impressed by well defined cicatrices transformed into shining, crystallized coal, the lower of the same thickness, the surface striat and the vascular scar oval as described above, of compact dull colored black shale and they in following the four different layers appearing successively from one bed to the other as follows: Bed 8 next the surface entirely ligneous, at least a cross section of the [illegal] (see Pl. XXXV bis 1 fig. 1). The plate of the specimen considered the form of the cicatrice is with L. elliptica Brgt. Pl 152 fig. 1. The scars are however more distant, more acutely narrowed upward. The surface distinctly wrinkled across etc. It is apparently a good species.

2. Sigillaria marginata n. sp. Same specimen 466 reverse. Surface ribbed, ribs large, two and an half centimeters, flat separated by distinct furrows decorticated surface a thin coaly layer distinctly striat-lined. Scars double oblong ovate, 8 millim. long, two millim. broad, parallel close, generally connected with the middle decorticated surface in double rows. Middle one eight millimeters broad, regularly or rather irregularly punctulate, same width as the cicatrices, which are four centimeters distant, truncate at the top, diverging laterally by two straight lines to the middle where they measure seven millimeters and hence rounded to the base, measuring altogether nine millimeters in length. The middle row is bordered on both sides by two concave irregularly lineate margins both of the same width as the middle one, eight millimeters so that the cross section of the surface would show it thus [illegal]. The vascular scars are indicated by a circular depression with two lateral minute hat elongated parallel appendages as marked in the figure. The specie is related to S. rugosa Brgt. Pl. pl. 144 fig. 2. by its border and the thickness of the corticated scars, but different totally by the double tubercle of the decorticated surface. By this last character it has some analogy to S. lavigata Brgt. Pl. 143 fig. 1. but the form of the cortex scars are different. I consider it as a good species.

3. Sigillaria alternans H. variegata, Brgt. I have a large number of specimens from Lacoe, which show the species as positively different from S. reniformis. The costae are very large, four to five and an half centimeters or more with corticated surface smooth and the furrows comparatively narrow, carinate

The surface scars are comparatively very small, in my specimen only several millim. long and about as large near the base where they are largest, almost hexagonal submarginal at the top with the border diverging outside and the base rounded. The figure or form of our specimen is about like that of Dreg. but the base is rounded (while in Dreg. this remark is not true, on the contrary. with the other lines an hexagonal cicatrice) as Sternberg describes it the lateral cicatricules are rebarbeat and the middle is minute, punctiform. In regard to the rebarbeat cicatricules it is nearly impossible to describe them so greatly they vary. Our fig. 6. show the great difference represented upon the same specimen sometimes between the surface cicatrice and the subcortical one. Some other specimen represent it still at least double than in the specimen and bi'nate either both part separated or united in the middle. These subcortical scars fig. 7 and 8 and 7 and 6 show very different and queer form and probably fig. 5 may be even referred to this same. The surface is deeply broadly striate, like the surface of a Calamite, the scars rhomboidal Centimeters are about 18 millim long, distant from each other 4 to 7 mill. horizontally and vertically with a deep concave notch on the middle and the borders deeply moulded fig. 5 represent them exactly. Except for the striae (deeply) surface and the mentioned the scars it could be easily compared to fig 8. N. may be new but is not describable from the subcortical scars only.

(1) Sigillaria reticulata Dr. Artis Dep. I have in Adirondack specimens from Alabama Al. 5 a specimen where scars are exactly like those of the Artis Report. S. reticulata, as large and as distant, the longitudinal striae quite as distinctly marked but no cross wrinkles. It might be referred to appear referable to the species. So could one of the specimens of Lesley of Sigillaria Brardei as figured in a sketch (in paper in portfolio) has scars of about the same form and somewhat distant, striae but striae between them. The relation of these forms to each other. However S. Brardei seem to have always double cicatrice. While the Alabama and Alleghany specimen have them simple. S. reticulata goes to the relations of the Brardei

(2) Sigillaria nova. S. reticulata affinis. N. 2018 of Dawson. Sigillaria Lepidophloios, Sigillaria ovicles. Fair specimen representing a trunk or branch, 19 cent. broad flattened to a thickness of a little more than one centimeter, marked with scars on both sides, scars ◇ about this size and form half cent. distant, marked at the top or below it by a short point, space irregularly striated or smooth surface coating of coaly matter thin. Under the scars present the same form still more enlarged and are merely split in the middle ◇ This resembles more a Lepidophloios than a Sigillaria. It has a distant affinity to S. mamillaris.

3. Sigillaria ? leaves. N. 2012 of Dawson is a fragment of shale covered with parallel long linear leaves apparently referable to Sigillaria. They are exactly linear six millim broad apparently very long, concave and smooth in the middle which is three millimeters broad and bordered on both sides near the borders by two broad smooth nerves concave on one side, convex on the borders. In the middle there are two obscure nerves distant 1 cent. should be figured

in proportion, while on the other side they have been relatively contracted and widened. Without an examination of the shale at Newport, it would be difficult to account for such a metamorphosis. At this locality, the shales present along the shore a series of low undulations, resembling slightly elevated waves; and there one can see that, in the state of fusion of the whole mass, the remains of plants, following the force of upheaval, have been, at peculiar places, drawn upwards and therefore elongated on one side, and of course drawn on the other towards the rachis. It is peculiar that the rachis and stems do not show any appearance of flexure and of deformation, and it is remarkable also that the same phenomenon of dimorphism is not observable on the plants found in the shale of the anthracite basin of Pennsylvania, where the flexures of the veins of coal are often abrupt, and where traces of tortion are frequently seen upon fragments of the combustible mineral. This deformation of vegetable remains may give an idea of the difficulties encountered by the palæontologist in studying, as he has to do, mere fragments of plants in their fossil state. Not only do these remains generally insufficiently represent the whole vegetable, but often they are deformed by various forces and influences, to which they are subjected in the process of mineralization.

§ 3. VEGETABLE REMAINS PRESERVED IN FERRUGINOUS CONCRETIONS.

As far as we know, from the specimens abundantly found in Illinois, the mode of preservation of fossil plants in concretions is somewhat different from what it is in argillaceous shale. These concretions are found, especially in the shale of Grundy county, irregularly scattered from top to bottom of the strata, in the form of oval, more or less elongated, generally slightly flattened concretions. They appear to have been formed by superposition of concentric layers of slowly deposited carbonate of iron or ferruginous clay around central nuclei, which are most commonly parts of plants, bones of fishes or the remains of insects and crustacea. Their size and form vary according to that of the body around which the deposit has been made. Some small leaflets of ferns are found in nodules which are not larger than a walnut; pieces of calamites are inclosed in cylindrical concretions varying in length from two inches to one foot or more; pinnæ of ferns or of *Asterophyllites* have been discovered in flattened concretions measuring about one square foot and only two inches thick, their form agreeing more or less with that of the body around which they have originated, though always showing an oval or round outline, by superposition of concentric layers. It is not yet clear whether the flattening of some of the specimens is the result of compression. Generally, the nodules which have cylindrical pieces of stems, or nutlets for nuclei, are round or exactly oval, while they

are flattened for pieces of ferns, in proportion to the breadth of the fragments which they have entombed.

The origin of these concretions has been explained in admitting a general tendency of some mineral bodies to *concentrate around centers, whether solidifying from fusion, solution or vapors.* (1) This explanation may be satisfactory in regard to other kinds of concretions, but from their peculiar position, their form and size, varying according to the nature and outline of the bodies which they contain, the nodules of Mazon creek rather seem to be the work of infusoria or *Bacillaria* concentrating molecules of iron around some centers, as it now happens in the formation of the bog iron ore, or in other deposits, in springs or pools, whose waters contain a solution of iron. This supposition appears confirmed by the manner in which the bodies in concretions have been preserved and selected for preservation. Though generally mere fragments, their integrity is complete, and yet some of them are of very soft texture. The pinnæ or leaflets of ferns are always found in them in a flattened position, their axis or rachis extending through the center of the elongated nodule, with the divisions on both sides; the surface of the pinnules, slightly swollen, as when in their living state, is marked by recognizable hairs or fruit dots, with distinct veins and veinlets, and their appendages, like the scales, are seen in the various modifications which they present in living specimens; for example, long, straight, flat, diverging, on primary rachis, and becoming shorter, ruffled and curled on their upper divisions. The small organs of plants appear, therefore, in a better state of preservation than in the shales. With small animals like crustaceans, scorpions, insects of a fleshy and very delicate texture, the preservation of form is still more remarkable. They are found entombed in the middle of the nodules just as if they were in life, or as if they had been transformed into stone while still living. The fruits or nutlets are not flattened. By the section of the nodules, which generally break into two equal halves by hard strokes on their edges, the middle and internal part of the fruit is exposed to view, while the outside surface is immersed in the stone. The numerous cones also of *Lepidodendron* found in these concretions are equally well preserved, either whole or in part, by horizontal cross sections. Some specimens not only show distinctly the pedicels of the sporanges and the blades in their natural position, but even sporanges with their seeds have been found in them, without perceptible alteration. In the cross section of these *Lepidostrobi* the sporange cells form a central row, which is surrounded by the blades in the form of a star.

Peculiar species of plants and animals, or their fragments, seem to have been selected as the nuclei of these nodules. They contain, for example, an

(1) Dana's Manual of Geology, p. 626.

described a p. 482 b. 1. is merely an old form of
inferior specimen of Tellinella, or Strigilaria

2. I have figured p. 546 (4) this form of a large
specimen which seems to represent the species. It must be compressed
& rare as I have not large. Note the prominent ventricose
about 1 cent. from umbilicus right,
impressed at the top of the ventricose
connected at the umbilicus by a smooth
rounded [illegible] See p. 483 b. 1.

3. Sigillaria cuspidata Brogl. ~~Lam. mal. le Mans.~~ Lacoe V. 622. Fig. 5 p. 546.
A large specimen. Nearly equal broad at the
ventricose de
ventricose-dilated posterior extremity, and the line thin but distinct to
the umbilicus
loans terminally
truncate
striae in the upper part parallel to the length of the
shell
acutely
at the
between them
3.

See p. 476 a. (1) Leidy Cont. Rept. V 617
Shell ovately
posterior 85 cent long 40 cent broad, flattened to about 5 cent
the ribs in 17 mill broad, orbicular, nearly equally
the ribs 8 mill. long 6 mill. broad with
[illegible]

V 623.
Conrad leaves
for the name of
[illegible]

2. Sigillaria Serlii, Brgt. from p. 436 & (3). Ulodendron. Lacve specimen 581. There is a larger specimen described 436 & (4). This one is fragment of a small, branch only two cent broad with very distinct rows of leaves and of cones. The bolster (pulvinuli) are convex or elevated, transversely rhomboidal; disposed in quincunx 4/c to 5 millim broad, 2/c to 3 mill. in vertical space. Vascular scars smaller of the same form at the top of the bolsters; Vascular scars three horizontal points, the middle one more distinct and often the only one distinct and deeply marked. Scars of ear small round or transversally oval five millim. transversally, 4 mill. vertically. Central point a small mamilla half a mill. broad, surrounded a border of parallel thick conical alveoles forming a star around the mamilla and a second row of larger more irregular scars immersed at the border or passing to the base scar or bolster. which cover the whole branch. Ear scars 2/c cent distant in vertical distance. One row only is marked. Compare this with Sigillaria Serlii as figured and described by Brongniart and Goldenberg it is easy to see that this is the true species of Brongniart which he says that this is one of the species the most doubtfull of the Sigillaria and to evidently intermediat between Sigillaria & Lepidodendron that one may be in doubt about the place which it ought to occupy. Compare the bolster to those of Ulodendron Majus. pl. XXI fig 4 of this Vol. Bolsters taken from good specimens of Ulodendron Majus both corticated, half corticated and decorticated, it is easy to recognize identity of this specimen with that Ulodendron, the decorticated surface being exactly represented in Goldenberg figure 6 of pl VII. of the Flora Saarbrontana. This small specimen gives also evidence of the nature of those scars of Ulodendra proving that they are scars of ears, probably flowering ears allready detached allready in small branches and with a merely punctiform point or very small axis leaving at the base the print of the bundles scars perfectly distinct and placed star like upon one specimen. These scars like those of the bolsters increase in size with the enlargement of the stems preserving however their form and character. One of the largest scars one cent in diameter a mere the bundle impression of the scales different in form of that of the bolsters is evidently recognized. Sigillaria elegans Gold. is the same.

Sigillaria continued p. 474a.

abundance of leaflets of various species of *Neuropteris*, especially *N. hirsuta*, of *Alethopteris Serlii*, of *Pecopteris villosa*, *P. abbreviata*, *Hymenophyllites Clarkii*, *Annularia longifolia*, *Stigmarioides*, etc., which are either rare or have not yet been found in the shale at Morris, while these shales are rich in the remains of *Odontopteris Schlotheimii*, *Alethopteris erosa*, *Ulodendron*, *Carpolithes multistriatus*, scarcely or not at all preserved in concretions. As the bank of shale bordering the bed of Mazon creek has not yet been opened, these differences may result from geographical distribution. Yet, as the animals and plants of soft exture, like the species of the genus *Sigillarioides*, have not yet been found in the shale of our American Coal Measures, it is evident that these remains have been generally destroyed by maceration, and only escaped total destruction by their entombment in these nodules. The same can be remarked on the remains of small animals. The remains of fishes found in these concretions are merely bones, scales and coprolites, while of molluscs, they have afforded only some agglomerations or very small shells.

§ 4. VEGETABLE REMAINS PRESERVED BY MINERALIZATION OR TRUE PETRIFICATION.

This kind of fossilization is performed by slow infiltration of mineral matter into the substance of the vegetable, when in a soft state of decomposition. The phenomenon is produced either by a total destruction of the vegetable substance, for which sand, clay or oxyd of iron is substituted by infiltration, or by a slow, still unexplained mineralization of the vegetable substance, by silex or lime. By the first process, the whole texture of the vegetable is destroyed, except the surface, preserved as in a mould, which shows the original outline of the vegetable, and bears the cicatrices of the bark and other external characters, which often render it recognizable. These moulds, generally covered by a coat of coaly matter, are rarely flattened by compression, and mostly represent trunks or branches of large size, sometimes fruits of a hard consistence, rarely branches and leaves of ferns. They abound in the sandstone beds of our Coal Measures, and some of our new species of *Lepidodendron* and of *Sigillaria* have been described from specimens of this kind. In the second case of petrification, on the contrary, the surface or outside of the vegetables is generally obliterated, as if it had been more or less decayed while subjected to mineralization, while the internal structure is preserved in its minutest details, and so distinctly, that it can be studied under the microscope when lamellæ of the fossils are detached, and polished thin enough to become transparent. Specimens of wood fossilized in this way, though often remarked in the Carboniferous formations of Europe, and very common in the more recent formations of

this continent, have rarely been found in our Coal Measures, and none as yet have been obtained, except from Southern Ohio and Northern Kentucky. Both these processes of fossilization have acted upon vegetables already separated from their support, and more or less decayed, or upon trees still standing or still living, when they were surrounded by the mineral substances which caused their petrification. Though not quite as abundant as prostrated fossil trunks, petrified standing trees are not unfrequently obtained from the sandstone of our Coal Measures. Near New Harmony, Ind., some petrified trees, varying in size from six to twelve inches in diameter, have been obtained from a sandy shale, and transferred to his museum in their standing position, and with their roots attached to the trunks, by my lamented friend, D. D. Owen. Though entirely metamorphosed into sandstone, their mould preserves remarkably well the scars of the point of attachment of the leaves, the wrinkles of the bark, etc., and show the gradual variations which modify the form of the cicatrices in passing from the stem to the roots. True petrified forests have been observed in banks of sandstone of the Coal Measures of Pennsylvania and of Kentucky. This phenomenon should, therefore, demand but a passing notice, if it did not give rise to some discussions concerning the mode and cause of dislocation or fracture of these fossil trees, and also concerning the causes and agents of their petrification.

Fossil trees, except when observed in their standing position, still half inclosed and sustained in the matter in which they have been originally buried, are always found in pieces or broken. This is observable as well in the fossil wood of the Carboniferous measures as in that so abundantly found in more recent formations; for example, in the Cretaceous and Tertiary beds of our continent. The fracture of the pieces is of two kinds: either irregular, in various directions, like the breaking of mineral substances produced by hard strokes, or horizontal, as if by a kind of cleavage, the separate pieces forming disks or regular cylinders of various length. Generally, in both cases the fractured surface is clean, smooth, distinctly angular, and showing that in most cases, at least, the breaking of the trunks has been effected after the fossilization. Prof. Goppert, who has visited the fossilized forests of Egypt, south of Cairo, and has published the result of his researches*, has found there the trunks subjected to a kind of multiple fracture, produced at various times and in various ways; some of the trunks having their fractured surfaces obliterated as if by decay, others showing on their fragments, still closely approached to each other, evidence of recent separation. He therefore explains their fracture as due to mere atmospheric influences, especially to sudden changes of temperature, which are not rare in those regions. This explanation could be admitted for

*Der Versteinerte Wald by Cairo, &c.; Acad. der Weiss: zu Wien. vol. 38, 1858.

1. Sphenophyllum primaevum. sp. nov. Whorls deeply four to five-lobed, the lobes being cut to near the central axis or sometime only to half the distance between the border and the center; lobes cuneiform truncate at the top, crenulate or obscurely undulate by fine dentate, rarely bifid in width, sometimes acute. Veins thin very distinct when the carbonaceous surface is destroyed; otherwise obscured simple at the base and dichotomous, forking once or twice. The whorls are small either close or distant upon a thin pedicel, about one cent. diameter of a hard consistence and in fig 4 & 5 corrected in a thicker waxy matter. Fig. 4 is the one sent by M. Middleborough a teacher from Cincinnati. The pedicel is distinctly seen from one central point to the other and borne but distinguishable only with a glass and was not marked in the figure. Fig. 5 is one of the two specimens communicated by M. Dyer. each of them representing only one whorl. Fig. 6. is copied as far as possible from four small specimen in soft blue clay from the base of the Cincinnati group. In these the carbonaceous matter in maceration has spread around or rather colored the clay in such a way that the form of the whorls and of their leaflets is not quite clearly discernable. Fig 6 represent it as well as it may be seen. The relation of these branches to a sphenophyllum or to a genus same as the others is certain. It is only impossible to determine if these fragment represent a different species. I have united them all under the same name. The leaflets appear much smaller and the veins undistinct. Fig. 4 is the best preserved specimen it is upon a kind of hard reddish ferruginous clay. The specimens of M. Dyer seem to have been found at the surface. At first they look as if partly covered by a thin coat of stony chert of recent growth; but this is mere appearance; that is caused by a thin deposit of muddy matter apparently by the drying of a basin of water where the plant was in vegetation. The same case is marked with the specimen of Sphenophyllum which I have upon grand and where the plant are represented especially by their skeleton or by the borders and the nerves.

2 ? Sphenophyllum ? Roemingeri. (Sp. nov. Specimens found by de Roemingen in the Lower Helderberger limestone of Michigan.) This species. fig. 1. (1[c] enlarged) is not quite positively referable to a Sphenophyllum. The stems are numerous, straight, scarcely one millim. broad, articulate, articulations distant 8 - 10 millimeters, slightly inflated either branching or rather forking or bearing whorls of small leaflets oblanceolate obtuse or truncate, when form as seen fig. 1 c. enlarged seems intermediate between those of Annularia or Sphenophyllum. These leaflets are very small, scarcely discernable, and mostly fragmentary. This organism covers a piece of limestone with numerous small shells, similar to Spirorbis carbonarius, one of them c c is enlarged and also small glomerules or oral punctate bodies resembling seeds as seen b b. These could be referable to seed of Chara if they were marked by spiral lines, but they are not and probably refer to species of Crustacea (Xanthidia) as figured by Dana manual 2[d] Ed. p. 257. The stems in whorls their mod of branching and the position of the leaflets is evidently of a Sphenophyllum or an Annularia; the shells fresh water shells.

the irregular fragments of silicified wood, found in connection with our recent formations, and which, in some countries—in Arkansas and Mississippi, for example—are in some places strewn upon the ground in profusion. Agglomerations of silex are rarely homogeneous or regularly compact throughout. They are interspersed with fissures or soft veins which, when penetrated by water, expand under the influence of frost, and determine fractures in various directions. But fossil wood broken in that way is rarely found in our Carboniferous measures. Generally, the fossil trees of this formation, when separated from the mineral substances in which they were originally imbedded and petrified, show the fracture by horizontal divisions, as by cleavage, and when in a standing position, and taken out of the matter which surrounds them, they separate in disks of various lengths, and can thus be taken out in pieces, which superposed afterwards rebuild the whole trunk, without marks of any other mode of disconnection, but horizontal through fissures. In that way the different parts of the trees mentioned above, as found by Dr. D. D. Owen, have been taken out of the sandstone separately and replaced in their order of superposition, to rebuild the vegetable in its original position. At Carbondale, in Pennsylvania, a true forest of *Calamites* has been crossed in the opening of an inclined tunnel through a bank of sandstone to a bed of coal underlying it. The fragments of petrified stems taken out of this passage are in such abundance that they have been used for the construction of a kind of gangway for running the coal cars out of the mines. These fragments, nearly without exception, are mere disks, varying in length from one to four inches, without relation to the size or diameter of the stems, which measure from three to six inches; the differences in the length of the sections being as marked for the large as for the small stems. All these fragments represent only as far, at least, as I could determine from the examination of hundreds of specimens, two species of *Calamites: C. Suckowii* and *C. approximatus*, Brgt. The walls of the tunnel are adorned by a number of these trees, still in their standing position and half imbedded in the sandstone. Though these stems are continuous, they show, at various and irregular distances, horizontal fractures where they break or are dislocated at their separation from the surrounding sandstone. Some of these trunks of *Calamites*, which in their natural state were evidently hollow, have been abruptly folded or crushed, like hollow cylinders in bending under their own weight, or by some external force; but even at the point of inclination or tortion of these stems, the fracture is horizontal or perpendicular to their erect position. At Paintsville, Johnson county, Kentucky, the bottom of the river, which at some places has been cleanly washed, is marked, as in a kind of irregular mosaic work, by the broken tops of large trunks of *Sigillaria*, still in their original standing position, all horizontally fractured. One of these trunks measures twenty-two inches in diameter. The same peculiar kind of horizontal

fracture is generally observable on the silicified trunks so abundantly found in some parts of Southern Ohio, especially in the bed of Shade river, near Athens. They are, most of them, pieces of stems of fern trees (*Psaronius*), varying in diameter from three to twelve inches, broken in disks from two to fourteen inches long. A few of these pieces of silicified wood are irregularly broken and disfigured on the outside by maceration; but generally they preserve their cylindrical form, and when of some length show here and there, at various distances, horizontal splits, uninterrupted all around the trunk, where a disruption is easily produced by a hard stroke. From the great bed of sandstone overlying the Pittsburg coal, near Greensburg, I have received, from Rev. W. D. Moore, large specimens of fossil wood, most of them long, irregularly broken, much decayed pieces, evidently representing sections of trunks broken lengthwise. These were found in various positions in the sandstone, and were mostly broken before they were imbedded in it. But among them there is one which bears, attached to a short stem, three diverging branches of its roots, a proof that it has been buried in its original standing position; and this one has its top horizontally broken and flat.

From these data and a number of others, which it is useless to mention, being all of the same kind, and bearing the same evidence, it appears that the fracture of the fossil wood is of two kinds: irregular, for trunks fossilized after prostration or in a decaying state, as they are generally found in our Tertiary and Cretaceous strata; and horizontal, by splits perpendicular to the natural direction of the stems and the roots. If the cause of fracture in the first case is, without doubt, essentially due to atmospheric agency, that of the second, which has acted upon the vegetable while it was still subjected to the process of petrification, is certainly different, and can be explained, I think, by the difference of density of both the surrounding mineral matter and the imbedded vegetable. Evidently, all the stems in the process of fossilization have been subjected to a softening process of their whole mass. The outside pressure of the surrounding mineral matter must have been felt, and can have acted only in one way, that is, vertically, as it happens in the forcing of a body of less density out of water; and the result of that action cannot but have been a tendency to dislocation, and therefore to splitting of the trunks in a horizontal direction. It might be supposed, perhaps, that a gradual accumulation of sand or other mineral matter around standing trees, in burying them, has formed layers of different density, whose action may have produced, in the fossil vegetable, zones of petrification also varying in density, tending, therefore to cleave from each other, and horizontally separable. But the roots of fossilized trees which tend downwards in an inclined direction, or even are nearly horizontal, should be split in an inclined plane and not perpendicularly to their axis, as they are, at least, on all the roots of standing trees which I have had opportu-

Organs unknown to me or of uncertain relation.

N. 429. of Lacoe's specimens. is sketched p. 532, fig. 9. It looks like a long linear capsule, 13. to 14 centimeters long obtuse or truncate and slightly narrowed at the upper end. a little more than two centimeters width, gradually narrowing. and curved (hooked at the base where it is broken and slightly inflated in the middle, showing like the fragment of a hooked pedicel. The middle from top to the base is irregularly very thinly striate; on both sides the border are slightly wrinkled in right angle to the axis which is slightly convex and indeed resemble to some fruiting capsule. It is distantly comparable to my Rhabdocarpus arcuatus of the Ly. survey. Pl. 30 f. 8 of my figures and I believe that this may represent a fruit of the same genera division which can not be a rhabdocarpus.

4876 It would seem as if the nature or genus of the wood subjected to petrifica-
tion might have had some influence on the nature of the agent which have
caused mineralization. I have in the following page alluded to the petrifica-
tion of the trunks of Gallipoli. Now, it is remarkable that as yet all the
trunks found silicified at or near Athens belong to ferns or fern tree at least
as much as can be seen from specimen collected. How is it that all the
silicified specimens are ferns? It is difficult to account for an exclusive kind
of vegetation in a place or in a locality under atmospheric circumstances which
have their influence over the whole extent of the coal measures by great abundance
of humidity. Indeed, in the shale of the coal though the remains of ferns are
abundant, we never find them separately, or in themselves without being
mixed with others. In the sandstone, the same remark strikes the observer.
All the trunks transformed in sandstone are Lycoderia, Hymenophyllites, Lepidoden-
dron and scarcely any Ferns. It is possible also that water over charged with silica
may have favoured the growth of ferns and then petrified their remains.
A great deal of question are still open to examination in the process of petrifica-
tion and in the distributions of the trees of the Coal.

nity to examine. Moreover, the silicified stems which have been noticed above as marked by horizontal splits, are of the same compound in their whole length.

The silicified wood of the Coal Measures of Ohio, as that also of more recent formations of our continent, furnish us some valuable data for the examination of another vexed question: concerning their mode of fossilization, or rather the origin of the silica which has produced their transformation. Two opinions, above all, have been advanced on this subject. Prof. Goppert thinks that the process of petrification has been very slow, of long duration, and that to explain it, it is not necessary to suppose that the water in which the vegetable substance has been transformed, was richer in silica than it may be now in its normal state. Prof. Schimper, on the contrary, asserts that the water in which wood has been silicified should have been of a higher temperature, more abundantly saturated with silica, and therefore, he concludes that the kind of mineralization has happened in a much shorter time than is generally supposed, and by volcanic agency, as is now the case in the vicinity of the Geysers of Iceland. (1) To sustain this assertion, the celebrated professor says: that the progress of the fossilizing process should have been rapid enough to reach the whole substance of the wood before its decomposition by putrifaction. But the woody tissue, when entombed and protected against atmospheric influence, is unalterable for a considerable period of time, and slowly passes, by emerecausis, into coal. It is, therefore, conceivable that in the first stage of this slow burning, when the whole vegetable has been reduced to a soft matter, it may be penetrated by mineral fluids which, by crystallization, transform it into stone. In the valley of Locle, Switzerland, large prostrate trunks, more than fifty feet long, were discovered some years ago in a bed of sandy clay of the upper Tertiary. These trees, most of them Dicotyledonous, had their bark still in a good state of preservation, their woody tissue admirably preserved, and looked indeed as if they had been recently buried. Yet their wood was soft enough to be cut through with the knife without effort, like butter. Beds of lignites, in Germany, where the emerecausis is in a more advanced stage, contains large trunks of wood, softened in the same degree, and already blackened. In that state, the woody tissues are easily impregnated by dissolved mineral substances. But to omit theoretical discussion and merely consider facts observable around us, it is evident that our silicified wood, as well in our Coal Measures as in the more recent formations, is found in connection with strata which show no trace of volcanic agency. The silicified trunks of Southern Ohio have been washed out by the creeks from the Mahoning sandstone. The area covered by this formation, and over which the trunks are found in greater

(1) Traite de Pal. Veget., p. 38 and 39.

or smaller quantity, extends from Athens southward, to the Ohio river, and in Virginia, as far up the Great Kenawha river as Charleston, or about one hundred miles in a direct line. There is no trace of any volcanic agency in that country. No distubance of any kind is observable in the strata, which have their normal, slightly-marked dip to the eastward; nor does the sandstone itself indicate, in its appearance, by a variation of its compounds or of its density, any trace of metamorphism. At Gallipolis, near the mouth of the Great Kenawha, a number of fossilized trunks, still buried in the sandstone, are seen protruding from the bank, in which they have been petrified in a prostrate position. As these trees have been examined already by other geologists, and mentioned as indicating a peculiar direction of a current, by which they have been brought and deposited, a short account of them here may not be uninteresting. There are five of them, from four to fifteen inches in diameter, their length unknown, lying, two in a southeastern direction, one due east, and the two others due south. The part seen out of the sandstone is much decayed, the outer surface, where it is preserved, is covered by a coat of coal varying in thickness from one-half to one-fourth of an inch. What is most remarkable, and bears directly on the question of their petrification, is that they appear to have been transformed into stone by different substances, showing a different kind of mineralization. In one of these trees the internal texture has been destroyed, and the woody tissue is replaced by a hard calcareous sandstone or clay, separating in layers of about one-fourth of an inch in thickness. A second is a compound of small crystals of iron flint, its interior being perforated lengthwise by a number of irregularly placed cylindrical apertures, filled with small iron crystals, forming regular stars of more than twenty rays. A third, of which I have obtained large pieces, it being of smaller size, four inches in diameter, is transformed into a compact, opaque, black silex, which does not preserve any trace of organic structure. (1) As these trees, of course, have been petrified where they are found now, it would appear as if different mineral substances, held in solution in the water, had acted upon the woody tissue in different ways, according to its nature. In any case, it is evident that the petrification has been performed in various ways, by the slow action of the liquids penetrating the sand, and not by the uniform crystallization of silica as it is now produced in the hot springs of volcanic origin. This is more evident, in considering silicified wood of our more recent formations. Neither in the plains of Kansas and Nebraska, nor in Eastern Arkansas, nor in Missis-

(1) It is marked by inflated articulations, like a species of *Anarthrocanna*, Gopp., and is as yet the only specimen found in our Coal Measures which might be compared to the trunks seen by Prof. Brongniart in the coal mines of St. Etienne, France, and compared to Bamboos, from their inflated articulations. (Lyell. Manual, 4th ed., p. 319.)

(1) Psilophyton (see for description of the genus Schp. Pal veg. III p. 548.

(2) Psilophyton (communis?) spec. nov. Specimen from lower Heldenberg b Aweningen. Branches comparatively thick at the lower part. three millimeters diameter, dichotomous, rapidely diminishing upwards. ultimate branches short. — The division (dichotomous) of this vegetable organism refer it to Lycopodiaceae and like the former described as Sclerophiton it may be compared to species of Psilophyton — The substance does not appear hard. at least though imbedded in limestone. their surface is flatt, indistinctly striate and here and there marked transversally by wrinkles or roughness. It does not bear any trace of leaves or other organs. The fragment on the right does not appear belong to the same species at least it is not branched and the surface is more distinctly wrinkled across as by the. It has the appearance of a slender rhizome and may be one of the species same species.

1886

Sclerophyton Dyo.

Stems very hard, and small, slender. foliform dichotomous division slender the upper ultimate ones very thin filiform simple and curved. — This definition is taken from a plant of the Silurian of Cincinnati, plant imbedded in soft clay. 2211905. dry, hard.

(1) Sclerophyton gracillimum. Stems slender filiform, a little more than half a millimeter in diameter at the base, slightly flattened or half cylindrical, transformed into hard coal polished anthracite. branches dichotomous the principal ones or those from the primary stem, the intermediate short, the upper ones long tapering curved and to an extremely thin end. By their consistence or their hard substance transformed into shiny coal, these plants are evidently referable to land or fresh water plant. Their dichotomous division refer them to Lycopodiaceæ. but their growth does not appear to be by spiral evolution; at least the terminal branches of this fragment are very slender, tapering and straight or nearly curved downwards. This may represent a branch entirely unfolded whose divisions therefore do not indicate the spiral evolution. In this case, it could be referred to Psilophyton and called P. gracillimum. This would be more appropriate than to constitute a new generic division. The substance of the hard corny stem has is easily separated in fragment from the soft clay (blue clay) leaving into it grooves or exact impression of its forms. The specimen is tolerably large and slender the part here exactly figured. It has some broken fragments of the few species scattered upon it. and evidently bearing the same characters. The specimen is from the lower part of the Cincinnati group and belongs to Res.t Hergen. - Described as Psilophyton gracillimum

(2). The above is satisfactory but acted upon. hence the description is useless.

See Plants of the Silurian.

1892.

Protostigma. Lesq.

Trunks or stems of various sizes marked on the surface by transversely rhomboidal scars whose outlines only remain without any trace of vascular scars or any other tissue.

1 Protostigma Sigillarioides. Stem cylindrical, slightly compressed, seven centimeters in diameter, two and a half to three in the flattened direction. Marked outside by somewhat irregular rhomboidal scars placed in spiral around the stem and resembling the scars of Sigillaria Brardei or rather of the outlines of these scars. These outlines are somewhat irregular, shallow, obliterated and blurred but not quite sharp, more or less deformed or effaced by the compression of the stem. Another branch however, small specimen fig. 8 of the plate has a branch or rather the impression of a branch, preserved in hard coal upon the bluish clay of the Carboniferous group. The scars are quite as irregular as the large specimen which also comes from this group, placed also in spiral order apparently more or less deformed by the contact of the clay when the surface is preserved or these coaly matter has become imbedded and preserved. The coaly matter of these scars or the part preserved upon the clay or coal prevents the supposition that these organisms might represent mere impressions. It is however certain that the scars are not quite as regular as should be expected from trunks of Sigillaria or branches of plants of that family. They are to my belief original organisms of that kind but still imperfect in their characters.

sippi and Ohio, where fossilized wood is found generally associated with a ferruginous argillaceous sandstone, is there any trace of volcanic agency. There is merely an evident relation of this kind of fossilization with the deposition of iron. In Ohio and Virginia, that part of the Mahoning sandstone containing silicified trunks, borders, and perhaps overlays in part, the area where the richest and most numerous beds of iron ore have been deposited. In the recent formations, the fossilized wood is generally associated with the red or ferruginous clay. Even in the small area occupied by our Post Tertiary formation at Barlow, Ohio, disks of silicified fossil wood of dicotyledonous species are found in a bed of red ferruginous clay, associated with species of shells of the genus *Anodonta*, entirely transformed into a compact mass of oxyd of iron.

§ 5. THE FLORA OF THE CARBONIFEROUS MEASURES OF ILLINOIS, CONSIDERED IN SOME OF ITS AFFINITIES.

As a whole, the coal flora of Illinois has, like that of our American Coal Measures, the general character of the Carboniferous flora of the whole world. It is well known that the representatives of this flora mostly pertain to a single class of vegetables: that of the acrogenous or vascular cryptogamous plants, containing the three families of *Equisetaceæ*, *Filices* and *Lycopodiaceæ*. The nodules of Mazon creek, where fragments of plants, even of the softest texture, have been preserved in their integrity, offered a good opportunity for examining the often proposed question: whether plants of a lower or of a higher order than those could not have entered into the compound of the coal, and, from a peculiar consistance of tissue, have been destroyed by maceration, without leaving any traces of their primitive forms. This has been affirmed, for example, of the *Algæ* or marine plants, which have left their remains in abundance in the Lower Carboniferous and Devonian strata, and also of the small cellular vegetables, *Fungi* and *Lichens*, which, at the present time, live on the bark of the trunks and branches of our trees, and are also observable, in the same circumstances, in the Tertiary and Cretaceous formations. I have already remarked, that no remains of any kind of marine plants have as yet been observed in the concretions of Mazon creek.* This is the more noticeable, as some of them have for nuclei bones of fishes of moderate size. As the so-called *Fucoides* have also never been seen in any bed of shale overlying coal strata, it is reasonable to conclude that the remains of these plants have not contributed

*Since this report was written, two or three nodules have been obtained from Mazon creek, inclosing marine shells, one of which is an *Aviculopecten*, and the others probably referable to the genera *Nucula* and *Polyphemopsis* or *Macrocheilus*, and indicate that these Mazon creek shales were probably an estuary deposit, in which the remains of marine animals were sparingly intermingled with the fauna and flora of the adjacent land. A. H. W.

in any way to the formation of the coal. But this is not a sufficient reason for asserting their non-existence at the Carboniferous epoch. *Chondrites Colletti*, Lesqx., collected from Lodi, Ind., and found in connection with a bed of limestone overlying a thin coal at the base of the true Coal Measures, or just above the mill-stone grit, like *Caulerpites marginatus*, Lesqx., from an analogous station in Pennsylvania, are sufficient proof of the existence there of marine vegetables already of a high order. But marine *Algæ* could not live in the low swamps where the coal was in process of formation, no more than they could live now on the surface of the peat bogs, even of those which extend along the sea shores. These plants had then, as they have now, a domain of their own; they have casually been brought to live upon a limestone formed under deep water, as the roof of a coal bed, but no remains of them could enter into its compound.

Of *Epiphyllæ*, small *Fungi* or *Lichens*, as parasites of stems and leaves, the concretions of Mazon creek have also no trace. They have, however, in great quantity that peculiar small organized body, *Gyromices Ammonis*, Gopp., which some European naturalists still persist in considering as a *Fungus**. In the nodules the white, shining, bony substance of this small *Serpulidæ* is better preserved still than in the shale, and the tissue of fragments of thick leaves, wherein it burrowed, is often perforated like a sieve, by the removal of this shell after the destruction of the epidermis.

The reason generally given for the non-appearance of remains of small, cellular, vegetables, like *Fungi* or *Lichens*, upon the bark of branches and trunks of the Coal Measures, is, that the maceration of the woody tissue and its softening has necessarily detached these small bodies from their place of origin. But if this was the real cause of their disappearance, small vegetables of this kind should have been preserved in the nodules of Mazon creek, as well as the small vegetable organs, scales, hairs, fruit dots, and even seeds of *Lycopodiaceæ*, which are as much exposed to separation and destruction by the process of maceration. We find, moreover, a large number of these small plants in the fossil remains of the Cretaceous and Tertiary formations, upon fragments of wood, which have been exposed, before their petrification, to maceration, just as much as the plants of the Carboniferous period. As these parasitic *Fungi* and *Lichens* are at our time of rare occurrence on ferns, as also on *Lycopodiaceæ* and *Equisetaceæ*, I would rather admit that their appearance is cotemporaneous with that of the exogenous plants, on which they especially thrive, and that species of this class, and also of mosses and *Hepaticæ* had scarcely any representatives in the vegetable world before the end of the palæozoic period.

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*Prof. W. P. Schimper places it in species of doubtful affinity in his Pal. Veg., p. 144 In his Permain Flora, Goppert has it still as a Fungus.

491a.

1. Tæniopteris Pennsylvanica. Sp. nov. Pa. 38, specimen found by myself at Shaw 1876. Leaflets linear, comparatively small one and a half cent. broad in the largest part of the largest leaflet which are numerous upon the same specimen slightly decreasing upward and obtuse, pointed as seen fig 1, borders entire, irregularly distant 4 millimeters apart, midrib comparatively narrow, scarcely one millimeter broad, deeply marked in the upper surface of the leaflet, lateral veins joining it either nearly perpendicular or by a slightly declining bow, then running nearly horizontally to the borders which they join either straight to it or in slightly curving upwards. The veins are thin but more distinct and distant than in the other species. Here one millimeter distance more generally simple sometimes forking either from near the base or from the middle or even near the margin. The plant was apparently pinnate and the part figured more leaflets for the specimen is covered with fragments of them, one of them fig. 2 rounded at the base and unequilateral evidently representing the lower part of a separate leaflet. This species is related to T. Gallica Gopp. Perm. fl. p. 130. Pl. 8 fig. 5 & 6, Apl 9 fig. 3 which has longer leaflet but judging from their last figs a nervation of the same type. Goppert says nervi secundarii e nervo medio tenui angulo recto egredientibus simplicibus vel bene dichotomis which agree with Goppert's figures and also with ours for the nervation. Schimper changes them and says: nervo medio mediocri, nervulis ex eo angulo acuto egredientibus, plerisque subhorizontalibus which is wrong. In Goppert fig 5 of Pl. 8 the borders are lacerated but not lacerate as in our species. See also for the nervation T. Bertrandi Bgt. Pl. LXXXIV fig. 5.

2. Tæniopteris Vimthii Lx. Lec Notes on Cod plant p. 41. N. 153. This species differs from the former by the large size of it leaflet, the fragment figured and the only one seen being 4 ½ centimeters broad, indicating a length of at least 14 to 15 centimeters. The midrib is comparatively much larger, three and an half to four millimeters broad, channeled in the middle and bordered both sides by a flat margin to which the veins are joined nearly in right angle and nearly evenly downward. The veins are still closer, thinner than in the above species and mostly simple as figured, joining the borders without any trace of upper flection. The borders are obscurely irregularly as upon dissepiments by maceration but not lacerate as in the former species.

That these two subcarboniferous species belong to the same genus or to Tæniopteris it is not possible to decide. No trace of fructification are remarked upon any of the specimens. Schimper has distributed the genus Tæniopteris in four new divisions Genera Tæniopteris for species of the upper Carboniferous and Permian viz. Anisopteris from the Triassic upwards. Macrotæniopteris for Tæniopteris dentata Heer & species merely described with borders angulo dentatis. a Jurassic species, which from the description recall what I have described as Pleuromeia sp. Ol. fl. - Oleandridium and Macrotæniopteris which like the former represents especially Oolitic species. Of their generic divisions are based especially to the geological distribution and to the fructification and as we have here the two first species even found the lower subcarboniferous and without traces of fructification, we defer them to the Tæniopteris which may be considered as an uncertain generic division. See for study Tæniopteris Münsteri, Gopp. in Genera Nov. 32 & pl. 12.

The shale of the coal at Morris and the concretions of Mazon creek have furnished also a number of specimens of three species, or rather forms, of *Palœoxyris*, a kind of organism which is considered by Brongniart, Schimper, and other naturalists, as a plant belonging to a higher class of the vegetable kingdom, that of the *monocotyledonous phœnogomous* plants. In describing these bodies, I have expressed my views on their nature. If the opinions of the European authors are right, we have already, from the lower part of the Coal Measures of Illinois, vegetable organisms of a class of plants, whose first appearance has been marked in the Triassic period. Though it may only effect their generic affinity, the presence of these bodies in the concretions of Mazon creek is the more remarkable that they are there associated, as in the Permian of Europe, with a quantity of animal remains, especially insects of large size, which have, as yet, not been discovered elsewhere in the Carboniferous formations.

There has been found in the Coal Measures of England and Nova Scotia, specimens of fossil wood, referable by their tissue, a compound of large woody cells or fibres, marked by vertical circular spots, to the Conifers or Pine family. It is remarkable that most of the fossil wood of our Devonian strata indicates the same characteristic form of cells, and that as yet, neither in Illinois nor in other parts of our true Coal Measures, no kind of branches, leaves, or petrified wood distinctly related to this order of vegetables, have ever been observed. The fragments described from a nodule of Mazon creek in vol. 2, p. 447, pl. xxxvii, fig. 3, of this Report, under the name of *Lycopodites asterophyllitæfolius*, resembles, indeed, a branch of some kind of Conifer, but it is as well comparable to some species of *Lycopodiaceæ*. We have also obtained from the lower strata of the Coal Measures of Illinois and of Pennsylvania, specimens of *Artisia transversa*, Sternb., a species whose affinity is still uncertain, it being considered by Dawson a Conifer, while most of the European palæontologists describe it with the *Lycopodiaceæ*. Our specimens are all transformed into sandstone, with no other part preserved but the mold, do not afford any light on this question. From this uncertainty as to the true affinity of these vegetable remains, and what is said above concerning other orders of fossil plants found in the Carboniferous strata, it would seem proper to conclude that the flora which has furnished the materials for the formation of our coal, and which covered the bogs of our continent at the Carboniferous epoch, was limited to a single group of vegetables, that of the acrogenous cryptogams. (1) The same

(1) Prof. Goppert considers the genus *Sigillaria* as rather related to a gymnosperm family. Its relation with the genus *Lepidodendron* is too evident to permit this conclusion; the cones and seeds of *Sigillaria* have moreover been found in our Coal Measures, of the same character as those described by Goldenberg.

remarks would seem also to authorize an affirmative answer to the often proposed questions:

1st. Does what we already know of the Coal Measures give us a just idea of the boggy vegetation of which the coal is a compound?

2d. Is the vegetation of the bogs of the coal a true representation of the whole flora of the epoch?

For though it is argued, with an appearance of right, that the whole flora of the Carboniferous time could not have been limited to that of the swamps, that a part of the land was high and dry, and as we have now, on our peat bogs, a peculiar group of plants appropriate to that kind of soil, and without analogy to the vegetation of our dry land, the same differences should have existed at the time of the formation of the coal. The contrary proposition, considered hypothetically, could be equally well sustained. From all appearances, the land, especially on our western coal fields, was, at the Carboniferous period, represented merely by a series of flat swamps, separated by lagoons, and therefore the whole vegetation of the land was essentially of the boggy kind. But, even if at this epoch there was any elevated land, the extreme atmospheric humidity should have forced upon it the same vegetation as that of the bogs, as it happens at our time in some parts of Ireland and Germany, where, under the influence of atmospheric humidity, peat bogs ascend on inclined slopes to the top of high mountains. Prof. Schimper says, in speaking of the ferns which constitute the essential vegetation of the coal formations: there is no other natural order of plants whose intensity of vegetation so much depends upon atmospheric humidity. Ferns are true natural hygrometers, whose individual as well as numerical development is always in direct proportion to the humidity of the climate wherein they live. Therefore, the land vegetation of the Carboniferous period must everywhere bear the same general character. A confirmation of this assertion seems also to be found in the fact, that even in the formations of great thickness of Nova Scotia, where trees are seen standing and imbedded at different altitudes, and where no coal is seen in connection with them, these trees are recognized as belonging to species, or at least to genera of the coal: *Sigillaria*, *Lepidodendron* and *Calamites*. But on the other hand, we have to account for the presence in the slate and sandstone overlying our coal strata, of various kinds of fruits or hard nuts, whose relation, for some of them at least, can not be traced to any species of the coal flora known by other kinds of remains: leaves, stems, etc. It is true that as fast as our acquaintance with this ancient vegetation becomes more intimate, some of these so-called fruits are recognized as peculiar vegetables of the coal, for example, some species of *Trigonocarpum* or *Carpolithes*, as tubercles of *Equisetaceæ*, or as vesicular appendages grown at the end of leaves of *Stigmaria*. But an explanation of this kind can not be admitted for nutlets, representing

Dictyophyton. Hall. See descriptions of the genus and species in Sixteenth Annual Report of the University of the State of Newyork appendix D. p. 84 etc.

Dictiophyton filitextile ?? Hall. Two specimens sent to me by Dr Goete of Buffalo from the Chemung of Newyork have characters which agree with most of the species described by Hall. They are the internal moulds of cylinders, one 21 centimeters long. two centimeters broad at its broken base, cylindrical but more or less flattened, more flattened in the middle where it is four centimeters broad and one and an half centimeters thick, still narrowing toward the broken upper end where it is 2½ cent broad and three to four mill. thick. Therefore spindle shaped. The other specimen is broader and shorter. Its base, three centimeters broad is flattened to one centimeter thickness. It is gradually enlarging upwards to its upper end, 13 centimeters from the base where it is broken and measures 5½ cent broad. and two and an half centimeters thick. It has also the spindle shaped form but as broken from or at the middle. The surface of both specimens is equally marked by a series of crowded lines or narrow filiform striæ, irregular in thickness. the joint of each horizontal row being twice as broad and thick as the intermediat one and the vertical fourth in the vertical row presenting the same difference. Generally even in both horizontal and vertical lines the second great row is more marked than the intermediat one and in that way we have a kind of checkboard like the following sketch. [redacted] The regularity is very great but not perfect. for there is sometimes in the horizontal rows more or less distance between the largest lines but it is however remarkable enough. This is the character of D. filitextile for D. Hall remark in its description: "That the striæ are sharp, linear, and in three "degrees of strength every fourth one being more deeply impressed or stronger "than the others. while the central intermediat one is stronger than the adjacent "two. - In the longitudinal direction, there is also a slight angularity or "greater prominence at regular interval of every eight striæ." For this and the cylindrical or spindle shaped form these specimens represent D. filitextile. But the broadest and shortest specimen is on one side evidently is marked by slightly prominent ribs or costæ at regular distances with the intervals flat or slightly concave just as Hall describes. I. Conradsi while on the other side no trace of these rib is marked. The form of the body is as in D. Conradsi reversed pyramidal; for the half which is left for the breaken in the middle and apparently spindle shaped like the other specimen. Hence we have in this one form the Chemung of Newyork the characters of both D. filitextile & D. Conradsi. I do not know when I have read that all these species of D. of Hall should be referred to the same. That may be the case. The one form specimens of Penn. reperti however very different.

4924

Dictyopteris.

1. Dictyopteris Scheuchzeri, Hoffm. Two specimens. Nos 504 & 505 of Manx field represent evidently this species. The first represents a single separate leaflet with a cordate-truncate unequilateral base, lanceolat gradually acuminat 3½ cent long, nearly one cent broad at the base with close areolation in all similar to the enlarged figure C. of Pl. XXXII fig. 16 of Ruemer. Except that this leaflet is unequilateral at the base and somewhat less the shape, it is like the fig. b. of Ruemer. The second is exactly similar to fig. 1. only much smaller. It is the upper or terminal part of a pinna with three leaflets connected to gether ~~a fasciculat~~ by decurrence of the upper part of the pedicel, ~~the leaflets being~~ or their pedicelled at their point of attachment to a common rachis, they are scarcely two and one half cent long and four to five millimeters broad. Except the size, the identity of the species is perfectly distinct in all the characters. The areolation is still closer than in D. rubella.

an internal ovule or seed, covered with three different envelopes like those of *Trigonocarpum Nœggerathii*, of which a fine specimen from Mazon creek has been figured in this Report. They resemble fruit of palms, and have been referred by authors to species of *Cordaites* or *Nœggerathia*. Still less can it be proposed for winged seeds or fruits generally described under the generic name of *Cardiocarpus* and *Rhabdocarpus*. These fruits, whose place in the vegetable kingdom is still problematical to palæontologists, are far better known from American than from European specimens, and their analysis can, therefore, be pursued with chances of more satisfactory results. One of them is described and figured in its whole, in the Arks. Geol. Rept., vol. i, p. 311, pl. 4, fig. 4, as *Cardiocarpus ingens*, Lesqx. Another, still more remarkable, has been published by Dr. Newberry, in the Annals of Science, of Cleveland, May 1853, p. 152, N. 2, as *Cardiocarpus samaræformis*. A third has been obtained in good and numerous specimens from the shale overlaying the coal of Coshocton, Ohio, by Rev. H. Herzer. This peculiar fruit, *Ptilocarpus bicornutus*, Lesqx., (1) is composed of a small oval seed, pointed downwards, rounded or obtuse at the top, obscurely ribbed in the length, attached to the inside of an oval scale, elongated upwards, diverging at its base into two short horns and overlapping the seeds by its border. The seeds, though generally found connected to the winged scales, are easily detached from it, and indeed all the specimens which I have examined, show the seeds already half detached from the top downwards, and to prevent them becoming lost, I had to take them out of the specimens and preserve them separately. This connection of a small oval seed to one side of a winged scale, point out evidently the relation of this fruit and of others related to it, and mark their places as belonging, if not to true Conifers, at least to the Gymnosperm family. However peculiar they may be in their form, though different from seeds of the species of our time, it is scarcely possible to compare them to any other family of vegetables. As the seeds are generally found separate from their scale, a number of fruits of our Coal Measures are probably referable to the new genus, *Carpolithes multistriatus*, for example. For some of the numerous specimens from Colchester, Ill., bear evident remains of scales overlapping the seeds like a broad rim, more or less lacerated and partially destroyed, especially towards the point. And in the nodules of Mazon creek, where these seeds are preserved in their original form, they appear merely tumid in the middle, as compressed under a scale, and not cylindrical. *Rhabdocarpus clavatus* is, perhaps, also a seed of the same kind, as are evidently the species of *Cardiocarpus* published by Dr. Newberry, loc. cit., and many European species like *Rhabdocarpus mammillatus*, *Artis*, etc.

(1) As the name indicates, this new genus *Ptilocarpus* is established for the special description of winged fruits having an affinity to those of the Conifers.

I have said above that the relation of these fruits can not be traced to any other kind of vegetable remains, leaves, branches or trunks of the Coal Measures, but there is, I think, a remarkable exception worth mentioning here. The shale overlying the coal of Cuyahoga Falls, Ohio, where *Ptilocarpus samaræformis* has been found with many others of the same genus, is, in some places, covered with a quantity of leaves of the peculiar *Whittleseya elegans*, Newb. These leaves, by their flabellate form, seem related to the genus *Salisburia*, while the nervation resembles that of a *Pterophyllum* or *Zamites*. I consider it very probable that some of the above mentioned winged fruits are related to these leaves, and that we have, therefore, two remarkable organs of species of the Conifer family.

It appears, therefore, that if the Acrogenous plants did constitute the essential part of the vegetation of the Carboniferous epoch, this vegetation had already representatives of the three essential classes of plants of our actual flora: the Phenogamous dicotyledonous, represented by Gymnosperms; the Phenogamous monocotyledonous, to which are referable species of *Cordaites*, *Nœggerathia* and *Trigonocarpum*, and the Cryptogamous, represented by the three families of *Equisetaceæ*, *Filices* and *Lycopodiaceæ*. And from all appearances, we have to admit the similarity of characters and uniformity of the entire flora of the Carboniferous period. For it does not appear that any of the species known from our Coal Measures have been transported from a distance, either by water or by the winds, and casually deposited in sands or clays of the coal swamps. The leaves and fruits are generally found in groups, a number of their remains being together, and covering a limited area, as if originating from trees or plants grown at the place around which these remains are spread, and, as it has been remarked above, all the species of fossil trees as yet examined from the sandstone, are referable to genera known from shale overlying the coal strata.

In pursuing the same mode of investigation, I have still to make some remarks on the affinity of our new species and genera of fossil plants from Illinois, in addition to what has already been said in the detailed description of each. As our table shows, by far the greatest number of our new species have been found in the concretions of Mazon creek, from which it is reasonable to infer that the preservation of many of these species is due to their mode of fossilization, and that the same kind of plants may have been constituents of the vegetation of the coal in other countries, though their remains have not as yet been found elsewhere. Of species of *Neuropteris*, for example, described and figured in the second volume of this Report: *Neuropteris Evenii*, *N. pachyderma* and *N. verbenæfolia*, all from Mazon creek, have been omitted by Schimper in his enumeration; and yet, though the two first have not been elsewhere discovered, their preservation is so remarkable, and their distinctive characters so

Oligocarpia Gutbieri Lesq. fig (Pl mines fig. 1. The generic description of the species Fab. Veg. (is right and sufficient also for the species. It does however for the form of the pinnules or lobes and for the nervation. The pinnules are generally like those of fig. 1. more deeply cut however. Sometimes as in specimen S. 56 the pinnules are longer, cut to near the base or even disjointed and separated at the base, longer and comparatively narrower, oblong obtuse. The midrib vein of the pinnule is undulate, the lowest veins forked once sometimes twice as marked in my enlarged figure; those above only once, nonebeing simple. Sometimes the two lowest veins forked twice, but it is very rare. I have not as yet seen specimens of fructification of this species in American specimens. Geinitz' fig. Pl XXXIII figs. 6 - 8 are good.

Oligocarpia quercifolia Lesq. I refer to this species with some doubt however a large specimen of the P.T. Coll No 87 from the Wet Stone of Indiana. The pinna is a very large one, its rachis is not seen upon the specimen which has however 5 parallel secondary pinnae from 20 to 27 cent. long. The rachis of the pinna is rigid, 2 mill thick. canaliculate, with short irregular lines, no traces of punctuation. Tertiary pinnae parallel equidistant (1 to 2 cent), turned or inclined upwards (60°) rigid with a broad rachis (channeled like the secondary) rigid, tensile, gradually alternate the basilar ones 4 cent long gradually decreasing to the top where they pass to pinnules, hence these secondary pinnae are exactly lanceolate. Pinnule in an open angle of divergence close, 9 pairs in the pinna 2½ cent long, the lower ones 8 mill in long gradually decreasing so that the tertiary pinnae have the same form, the secondary ones decurring (slightly at the base which pass under the upper lobe of the inferior pinnule the lower dilated pinnately divided in 4 rarely 5 pairs of lobes cut to near the thick midrib obscurely three toothed, obtuse or half round as seen with the naked eyes with strong very distinct veins forking twice generally at the base & generally once. The species is allied to Pecopteris Hoeninghausii greatly differing by the rigid pinnae, short tertiary pinnae, pinnules cut merely at the top but joined to near the midrib along the line of division by the nervation and the scarcely dentate lobes. The rachis is perfectly smooth the surface of the lobes nearly flat and the veins perfectly distinct.

Macrostachys.

1 Macrostachya infundibuliformis Schp. I have copied the remains part of a trunk from No. 202 The figure is exact somewhat obscure and corresponds to the description of Schp. Pal. végét. 1. p. 333 especially to the figure in atlas. Pl. XXIII f. 15, 16, 17. The ears are very abounding in the carnel sheath of Cannelton. The fragment of stem is the only one which I have not seen. Though the description may be exact, it does not account for the two rows of large round scars. one very large the other smaller all circular which seem to be the base of two kinds of ears in rows. There are indeed two size of ears in the specimens of Cannelton. They should be copied. Some of these ears are somewhat curved, others quite straight — Schimper speaks of leaves attached around the stem, joined together and forming sheathes. which base or remnant of the base are attached upon the borders of the articulation In one specimen the borders do not bear any trace of remnant of leaves a sheath and an mouth, covered like the whole of the specimen by a thin coaly or layer of coaly matter on the side where this surface coaly is destroyed the striæ are slightly more distinct but not as much as marked upon the figure. Indeed the striæ do not alternate at the joint but rather seem continuous. Schimper considers the broad scars as scars of branches. They bear at the bottom a round mamilla and from the bottom to the borders rays diverging star like, mostly obsolete or indistinct. They are exactly figured. Branches of Calamites ramosus or nodosus, see my figures have their branch scars with rows of divergent rays which have some relation to those of the figures. The small scars might represent the young attachment of the ears but they seem too close for the size of the ears. See also fine small branch. Ma-465.

2. Macrostachys sp. ? mention here this species from this Rep. p 427 & 5. (not figured) See also 419 b 1.

well marked, that their specific value is beyond question. The case is still more evident with *Neuropteris verbenæfolia*, with which we now have a more intimate acquaintance, from the discovery of a number of specimens, all found at Mazon creek. I mention only these species, not merely as a kind of vindication in favor of our American discoveries, but in order to secure points of comparison in considering the geographical distribution of the plants of the Carboniferous epoch.

No more evident proof of the truth of what is said above could be afforded, than the discovery in the nodules of Mazon creek of numerous specimens of organs, which have as yet scarcely been found elsewhere. The fructification of ferns and their rhizomas, are of this kind. Besides two of the species described in the genus *Staphylopteris*, we have, in nodules from this locality, seven fruiting species of *Alethopteris*, six of *Pecopteris*, with one *Asterocarpus*, most of which were as before unknown in fructifications. And if the fossil fruit-dots of ferns were not generally obscured, and their form and position indistinct, discernible only, as they are, through the substance of the leaves, we should have had for description a far larger number of fruiting specimens of ferns. When Prof. Brongniart published his justly celebrated Fossil Flora (1848), only three species of ferns, *Pecopteris cyathea*, *P. hemiteloides* and *P. Miltoni*, were known and described, with fruiting branches. No fruiting racemes, like those of a *Staphylopteris*, had then, nor have been found even now, after forty years of further researches in the Coal Measures of Europe.

Considering this peculiar scarcity of fruiting ferns, Schimper comes to the conclusion that, as arborescent ferns of our time are rarely fertile, the species of this genus, in the Carboniferous epoch, were mostly fern trees. I should be inclined to admit the same conclusion, especially in considering the number of trunks of ferns, *Caulopteris*, found in the Coal Measures of Illinois, if the coal flora represented in the concretions did not indicate a proportion of fruiting branches nearly as marked as it would be in collecting ferns of our time in a given area.

It is peculiar that, though evidently belonging to herbaceous species of fern, there has not as yet been found any fructification of the genus *Neuropteris*. Leaves of *Neuropteris hirsuta* are the most abundant and the best preserved of all the remains of fossil plants in the nodules of Mazon creek, and yet neither here, nor anywhere else in our Coal Measures, has anything been discovered which might be considered, beyond a doubt, as its fructification. For the intumescence of veins or veinlets, often remarked on the surface of the leaflets of this and other species of *Neuropteris*, and doubtfully considered as produced by groups of fructification placed underneath, seems rather to be the result of some casualty of maceration of the leaves. A mode of fructification of this kind does not agree with that of ferns, and is rather comparable to the *Osmundaceæ*

of our time, which bear their fructifications either as separate racemes or on peculiar divisions of their fronds. The fructifications of species of the genus *Odontopteris*, so closely related to *Neuropteris*, are known for *Odontopteris Schlotheimii* and *O. Reichiana*, Gutb. The fertile pinnæ, not yet found in connection with sterile fronds, bear inflated, round leaflets resembling small bladders, which have no relation whatever to the intumescence of veins considered as the fructification of *Neuropteris*.

Still more than their fructification, the rhizomas of ferns have hitherto been unknown to palæontologists, at least from the Coal Measures. Prof. Goppert has given, in his Foss. Farnkreuter, p. 91, tab. 33, fig. 1, the only fragment which as yet has been published by European authors, as evidently belonging to true rhizomas of the coal. In his Pal. Veg., Prof. Schimper has published, under the name of *Rhizomopteris*, two fragments of plants, *Selaginites Erdmanni*, Gein., and *Selaginites uncinnatus*, Lesqx., which, from the spiral development of their branches, their ramifications and their scales, he considers as representing small rhizoma of ferns rather than *Lycopodiaceæ*. I cannot agree, on this subject, with my celebrated friend. The plant published as *Selaginites uncinnatus*, Lesqx., vol. ii, p. 446, pl. 41, of this Report, is too slender, and has too slender divisions to represent a rhizoma, even of a climbing fern. Its slender branches, rather pinnately placed, are not more curved in spiral than they may be in some of our species of *Lycopodium*, and the divisions are evidently pinnate, like leaflets, and not scattered like hairs. The plant named *Lycopodites Erdmanni*, by Geinitz, and which, as Prof. Schimper remarks, is different from *L. Erdmanni* of Germ., has, like our *Selaginites crassus*, the ramification and appearance of a *Lycopodium*, but from the examination of peculiar specimens of the same species, seen by the author, it seems to belong to a rhizoma. Even admitting that these two species represent climbing or ærial rhizomas, this small proportion of organs of this kind, compared with the numerous species of ferns known from the Coal Measures of Europe, would be unexplainable, but for our American species. For the concretions of Mazon creek, and only these from the whole extent of our Coal Measures, have furnished us numerous specimens of eight species of these organs, some of them referable to subterraneous rhizomas. It is, therefore, apparent that the organs of the ferns of the Carboniferous epoch were the same, and in the same proportion, as those of our time, but, that some of these, like rhizomas and fruit-bearing fronds, have been more generally destroyed in the shale on account of their soft texture.

The inflated subcylindrical base of a species of *Annularia* and of a *Lepidodendron* are also two remarkable characters, not recognized as yet in the same kind of plants of the Coal Measures, and which we owe still to the peculiar preservation of vegetable remains in the concretions of Illinois. Species of the genus *Annularia* may have been represented in the swamps of the Carboniferous period by two kinds of leaves, according to their growth, either in water

Calamodendron ! (Calamites approximates ?). I have a very fine small specimen from Mansfeld. M. 361. which represents a species of the genus as described by Dawson (vein or Calamodendron and Calamites and by Grand Eury. It is a branched young stem with an internal cylinder of 16 millim. thick a broad enlarged at the base 15 millim. with 15 articulations at unequal distance, four to nine millim. distant. The stem slightly contracted above the base is enlarged at the 6th articulation, then again contracted to the 10th art. and then again enlarged. It is thus more or less distinctly strangled at divers points. The articulations are deeply and distinctly marked. With some small scars of branches, the surface between the articulations is distinctly but somewhat irregularly striate, the striæ being either very thin intermixed with some stronger ones or more equal but not continuous across the articulations where they are modified in size and distance; they do not bear any trace of appendages or verticillate mark at their base. The principal striæ about one millim. distance are intermixed in the intervals by very thin but lines two or three between each, irregular, disconnected sometimes distinct, sometimes absent. — This internal cylinder which has the facies and appearence of a small branch of Calamites approximates is bordered or surrounded, for the borders appear flattened to a by a cross section by an amorphous, apparently woody band variable in thickness from three and an half to 6 millimeters; the surface is flat, smooth or amorphe only marked across by irregular steps perceptible. wrinkles the more distinct corresponding to the articulations and in the same direction. This fine specimen would be figured. See Grand Eury on Calamodendron. There is not any coincidence in the conclusions of authors on their nature. Grand Eury does not mention any where Calamites approximates. I believe however from what I have seen from specimens that this is a species of Calamites what the part described here is Calamodendron. No Calamites approximates shows any such irregularity as this stem.

or out of it, like some of our actual water plants which have for their sustenance in water peculiar organs, sometimes a mere swelling of their petioles, as in *Trapa natans* for example, which disappear on the emerged parts. A like lubulose, bladdery form characterizes the leaves of the species of *Stigmaria*, whose long stems were sustained by these floating organs, and we could therefore easily admit a dimorphism of the leaves of plants which, like *Annularia*, evidently lived partially in water. But the cylindrical form of the leaves of a *Lepidodendron*, like those of *L. rigens*, cannot be explained in the same manner. These leaves are evidently aerial organs, and by their form expose a new characteristic not yet surmised in species of this genus, though it was already obscurely marked by the position of the vascular lines seen in a different relation, according to the plane in which their leaves have been flattened in shale.

The shales of Morris and Colchester have remains of small branches of a *Lepidodendron*, referable to *L. elegans* or *L. gracile*, Brgt? one to two inches thick, mostly dividing perpendicularly to their axis, bearing short flat leaves, and so abundant that they fill the shale to the thickness of one foot or more, extending and covering a large space. These remains, scarcely varying in thickness, do not look as though pertaining to erect stems, but rather appear like creeping branches, extending all around, like those of some of our species of *Lycopodiaceæ*. The roots of *Lepidodendra* are unknown as yet, and I believe that some species of this genus, heretofore considered as branches of trees, are mere creeping stems, which, in some circumstances, only bear flowering stems, or true *Lepidodendra*. It is the same with the genus *Sigillaria*, the species of which I consider as fruiting stems of *Stigmaria*. It is easily conceivable that large trees, like those of *Lepidodendron* and *Sigillaria*, could not be sustained upon the soft surface of the swamps of the Coal period, without a peculiar kind of support; and this solidifying process of the surface could only be afforded by a vegetation like that of floating or creeping stems of the same kind of plants. Some *Lycopodes* of our time, when growing in swamps, *Lycopodium inundatum* and *L. clavatum* for example, cover the soft ground with their interlaced creeping branches, bearing their rare flowering stems here and there, out of the reach and influence of water. Many aquatic plants of our time also multiply their stems, extending them in every direction by constant division, and fill large basins, even small lakes, never bearing any flowering stem until they have formed, by compact netting, a kind of support strong enough to sustain them out of water for fertilization. This is the case especially with some species of our mosses, *Hypnum Lycopodioides*, *H. fluitans*, *Sphagna*, etc. Some of our species of *Utricularia* have two very distinct modes of vegetation. *U. intermedia*, for example, has, in water, its stems infinitely expanded and divided, sustained as they are by their utricles, while in sand the same species has a simple stem dividing at the base into three

branches, true roots which still lower bear a few thread-like filaments, without trace of leaves or utricles. I have compared this kind of vegetation to that of *Sigillaria* of the Coal Measures, merely, of course, for the mode of development.* Remains of *Stigmaria* fill whole banks of fire clay of our Coal Measures, to a thickness of from six to fifty feet, and no remains of *Sigillaria* have never been found in this clay in connection with them. Prof. Schimper mentions an analogous circumstance from his observation on the Vosges sandstone (*Grauwacke Vosgienne*), whose entire strata are also filled with remains of *Stigmaria*, and where no *Sigillaria* is ever found.† Roots cannot live by themselves, independent of any other kind of organs, and it is certainly impossible to explain the mode of vegetation, the form, the nature of the Stigmaria and its action, in considering it as a root. But admitting these plants to be the floating stems of species of Sigillaria to which they have been sometimes seen attached, their peculiar nature and mode of vegetation becomes explainable, and in circumstances where they are found in the Coal Measures, they are in perfect harmony with the general vegetation of that epoch, as well as with the end which they were called to achieve. As is the case especially with our floating mosses, these floating stems of the Carboniferous epoch have the characters blended in a kind of uniformity which renders them scarcely recognizable. All the *Stigmaria* bear the same kind of cylindrical, bladdery leaves, and therefore have all, though belonging to different species, the same kind of cicatrices upon their stems, viz., a circular, double ring, with a single vascular scar in the center. This peculiarity has been heretofore a problem to palæontologists. Binney has seen *Stigmaria ficoides* as the roots of *Sigillaria reniformis*, Rich. Brown has seen the same *Stigmaria* as the roots of *Sigillaria alternans*. Prof. Goeppert has obtained a splendid specimen of *Sigillaria elongata*, with *Stigmaria* as its roots, and Prof. Schimper has the same *Stigmaria* at the base of a fourth species of *Sigillaria*, and the fossil trees procured by Dr. D. D. Owen, should be quoted still as a fifth species, *S. Owenii*, Lesqx., bearing *Stigmaria* as its basilar appendages. This *Sigillaria* to which I have already alluded, has its mould preserved in perfect integrity with the scars of the stems, those of its base and those of the divisions called roots, fully discernible. The cicatrices of the stem have no affinity with those of any other species of *Sigillaria* hitherto known. They are double, horizontally distant from each other one and one-fourth inches, vertically three-fourths of an inch, formed of two transversly oval scars, close to each other, joined at the corners by a deep line, thus resembling in miniature a pair of spectacles. The small oval scars are about one-eighth of an inch across in their broadest diameter, deeply marked into the

*W. P. Schimper, Terrain de transition des Vosges, p. 324.

†Prof. Goppert, in his Permain, compares it to that of the Prothalliun of the mosses. There is a mere analogy of division of the branches; nothing more.

from 479 c.

Cordaites ? Ma. 321. A small branch. 1½ cent. broad, flatte 498.
nd by compression, apparently marked by articulation where it branches
the middle and at the top. The branch is half as thick as the main one
3 cent long bearing at its top one half which seems attached to the point. The
main branch also about 5 cent long from the point where it divides
ved one cent thick bearing thirty a fascicle of leaves, which seemed to be
in a whorl. That may be a subdivision or fortuitous of the stem together
with the leaves coming out of the same place. (The leaves 12 millim. broad
or more distinctly veined. Primary veins very distinct, three in one millimeter
with 2 to 4 secondary veins between them. The stem and branches are also
merely strict costate in the length also obscurely marked across by circular
bands left thin of articles and covered with a thin coat of coaly matter
apparently not striate or veined. See rectification p. 536 (14)

2 Cordaites N. 2 A naked branch or without leaves Ma. 2. bearing
flowers, has been described already p. 420 c. 1.

3. Cordaites mansfeldi ? Ma. 148 fig. 2. Stem or branch about 23 cent long
three cent. broad at the base, flattened. Base tapering gradually downwards
to the top which is conical and covered with a fascicle of leaves; bases attached
all around the stem, small by a slightly enlarged rhomboidal base as figured
(see p. 421 fig. 3; the fifteen millim broad exactly linear, very long, 30 centi-
meters, obtuse or truncate at the top as far as can be seen from the two only
leaves preserved in their whole length. Point of attachment of the stem
marked by oblong inflated scars, 1.6 - 1.8 in one centimeter; secondary veins three
to five between intermediate to the primary nerves, surface more or less evidently
wrinkled across. See below 3a. see note p. 535 (6) with C. Conwentz.

4. Cordaites ? Ma. 370 seem referable to this
form described p. 479a 3 from Me 258. It represents a ribbed branch
3 cent thick, but flattened, 17 cent long articulated in the middle
and then curved to one side with apparently bundles of leaves
coming out from the articulations or from below it. The points of
union of the leaves to the stem are not clear. The leaves are very
long and narrow, a little broader than two millimeters marked by
a prominent midrib. The stem bears the appearance and character
of a rib, a surface ribbed in the length, ribs or striæ flat, 3 millim.
broad, undistinct and under the covering coat of coaly matter
transverse ribs are marked, about of the same breadth.

3a. Cordaites Mansfeldi. as above 3. Specimen Me 310 a represents this species in a
branch 22 cent. m. long, with surface marked like that of the former by a cross wise
wrinkle coaly coat and underneath somewhat smooth or obsolitely striate surface, this also
faintly wrinkled cross wise and with distant and distinct scars of leaves. Like
those of a Cordaites linearis Grand'Eury to which this species seems closely
related if not allied. It bears also short branches of imbricated leaves, lanceolate
acute as cordaites communis p. 499 c. 3, which come out from the branches, not
from the axils of the leaves and leave a round depressed scar. 310 D has a similar
kind with the leaves closely imbricated at the base from 1½ to 3 cent long
by millim broad at the base exactly lanceolate and sharply pointed (Specimen
should be figured) (see p. 537. (15)

Distribution der Cordaites

§1. Leaves enlarged or cuneate at the base, semi amplexicaules, surface very narrowly and obscurely striate. Represented by Weiss N°1 & N°2. in 1499 c. see plate & mod ba
See Leaves arrangement of leaves in spec. p. 205. My figure 90 b of pl. 27 bb. shows the base of this Chapter the apex narrowed. That of this ampliat. Fig 2 shows a large and amplexicaules. There is comparatively to the size of the leaves very little difference between this 90 b and that of the following section. p. 499 c. 2.

§2 Spread leaves narrowed to the base distinctly nerved lanceolate twice with 3 veins of the transition Cordaites gemmiferi Cordaites communis, (Cordaites ~~Radiates~~ fractydesmi.

§3 Narrower leaves distantly placed upon the branches with more or less distinct base Cordaites gemmiferi etc. leaves of leaves. leaves linear distinctly nerved. flowers in racemes. Cordaites angustifolius, 420a C. Manfredi, In the Leaves 498a 478b. 537(4) have a distinct specific or binomial p. 360 (4)

§4 Leaves not pedicelled, pedicel inflated at the point of union narrowed downward forming irregular thick wedges upon the stem. Leaves of the type characters in the former division. — Cordaites Cordates.

§5 Cordaites? leaves crowded narrow, very long, without distinct nervation, decurrent at the base, more or less diverging from the stem. Stem thick covered with the coal, bark formed by the imbricated base of the decurrent leaves. Cordaites defluens p. 534 (4). C. decurrens p. 534 (5) Cordaites contentus. C. 535 (6).

§6 Dicranophyllum Grand Eury. Leaves very narrow dried by the nerves a nerved dividing in filaments at the top. p. 535. 7. – p. 536, 14.

Juste sedis:

§7 Leaves either distant and simply attached to a narrow stem, sometimes in fascicles, three or more on one side of an articulation of the stem. Cordaites fasciculatus p. 479c (3) p. 538 (8)

§8 Leaves divaricating in anomalous branches. – Cordaites anomali p. 5

§9. Leaves widely enlarging upwards like Nueggerathiae.

§10. Cordaites grandifolia p. 478a 538 (9).

§11. Cordanthus species p. 536 (11 & 12)

Remarks on Cordaites with Cylindrical leaves p. 586 (13).

1 dantes boraniifolius Mss. Sates fuctorily described. p. 360. 6. from Cambridge specimen
461-1 from Mc 90. — p. 478 b. from Mc 90 and another with racem. of flower figures.
Mc 90 not figured represent bearing leaf same as fig. 5. of another sp. 90. base 17 millim.
broad not 13 as marked p. 478 b. 1. the basilar curve descending a little more
on one side or on the other with an inflated or intumescent. boide around. the
characters are the same as those given — Grand Eury p. 216 for Cordaites boraniifolius
The veins which seem a little more distant in the middle seem formed by two
one of which the other are lowered the borders closer and equal. Fig 4 of my plate
does not seem to be referable to this species on account of its large base. 5 on the
same slab as fig 1 with flowers — This parts described p. 420 a. 2420 b. On
a 2. stem bearing flowers fig 1 of my plat remark that the scale figured
exactly are thick, forming a button like mamilla. The branchlets are compara-
tively thick 1 1/2 to 2 millim thick as seen in the figure. Some are half decomposed
by maceration and flattening at the end or from the middle upward
dividing in thin filaments or filiform lacinia like the stem wood of
Dicranophyllum Grand Eury. The scars are two distinct by and
regularly marked in the figure. the point of attachement of the branchlets
is seen in round depressions more or less irregular a simple one left
upon the bark, in a (which about 1/2 millim thick) represented enlarged in a. the outside part being
a deep indentation and the inside marked black a mamilla projecting
a little above the surface of the wood. The leaf aside fig 4 which seems the base
attached to a branch and stem embracing it. is far different from Cordaites
Boraniifolius. I have three specimens of it. It is the following.

2. Cordaites ~~Salyides~~ ~~clavicles~~ ~~Lesleyes~~ #1 See Grand Eury p. 216. — Spec. Ma reverse of 305. 2.
Nozzy the fragment figured under 208. This species has very large leaves part of one
crassinervis in Mc 305 is 40 cent long 5 cent broad, perfectly linear with the base
embracing rather enlarged than narrowed. Another leaf on the same
specimen 305 shows the base cut flat or in right angle to the leaf with the
base point of attachement marked by inflation of the base. viz alternate
inflations and depressions showing points of attachement. The part of
leaf should be figured also though fig 4 shows well enough the mode of attache
ment semi amplexicaule of the leaves. They are thick quite one millim as seen
on a fragment detached. the upper part very minutely obscurely striate, the
veins being immersed into the epidermis 7.8 per millim, the lower part more distinctly
obtuse but ~~marginal~~ about the base ~~remarks~~ 4-5 per millimeters. The stem
part of which is on Ma 208 is more coarsely and irregularly striate
6 to 7 cent broad, the striæ irregular in size and here and there inflating
or thinning so that with the eyes the veins or striæ do not appear continuous
They are sometimes however two sometimes three in one millimeter even one millimeter
apart. the bark is thick 1 1/2 of coal 1 millimeter more with the
surface marked like that of the cylinder of wood under it, for the rest
it flat or flattened and appear like herbaceous. This branch shows
the point of attach of a leaf seven cent broad somewhat cordate
Figures the above parts of leaves Ma. 208. 2 reverse of 305. The the branch
that which is already figured is somewhat smaller, 1/2 of the plat, the branch apparently
hard, the coaly surface also thick very much shining without trace of striæ

3. Cordaites tommasinii (= chaneyi nom. ined. of Sweden) Specimen from Britt N° 143. 221.
Leaves long not as large as in (1) of this page, the part preserved is 14 cent 22 cent long
37 millim broad at the broken top. gradually narrowed to the base where it

15 millimeters just above the rounded point of attachement ⌣ recurved on the
border flat somewhat thick, distinctly veined. The upper surface has the veins
less distinct with a thick epidermis distinctly cross wrinkled ⌘ Primary nerves
16–18 per cent. in the middle of the leaves, rounded and less distinct at the upper surface
sharply keeled on the reverse ~~where~~ with three to four intermediate
secondary veins. N. 221. ~~Specimen~~ has the leaves attached by a branch showing
distinct scars of leaves ○ and bearing apparently in the axils of the leaves
unfolding buds of short small lanceolate imbricated leaves. two to two and
an half centimeters long about half a centimeter at the base with ~~margin~~ ciliated
small cones (one only is distinct) with imbricated scales, Cordaianthus gemmifer
baccifer, Grand Eury same as the one described and figured here as Schutzia
bracteata Ow but without bracteæ. The species may be one of the common
of the coal as represented by fragments of leaves, any how it is not the same
as Mazon described above which has the primary nerves twice as close. The
axis Mazon described above which has the primary nerves twice as close. The
cicatrix bark of the stem is somewhat thick about twice as thick as in the stems
described here

4. Cordaites mansfieldi d. Ma 148. See description p. 493 a. 3. It is correct. The nervation
is about as in the former species from which it differs by narrower leaves equally and by more
numerous thinner intermediate veinlets. This represents the Boa Cordaites of Grand Eury.
5 ○ ~~divers~~ ~~irregular~~ scars, by ~~your~~ specimen Di. 4 see description p. 420 a. 1. Differs
from the former by the reflexed leaves, the primary veins ~~much~~ closer, the interme-
diate ones less distinct. The leaves as far as can be seen from the fragments
are shorter. The relation is however very close Remark that in my figure
the base of the leaves is too broad. The scars however are very proteberant upon the
branch, taking about the whole diameter ⌣ obliquely in that way. But the
base of one leaf very distinct is exactly ⌣ like this. It is about the same
size but the scars are much less distinctly marked

6. Cordaites pachyderma sp. nov. Specimen from Britts, Clinton N. 64, two of
them on 64 a representing a stem or branch a little more than 3 cent broad covered
with a thick irregularly distinctly striate bark (ie Cork) and also distinctly wrinkled as
marked by distant, large, oval scars of leaves ○ nearly as broad as in
Cordaites communis and under the bark or decorticated surface equally
distinctly irregularly striated in the length and deeply wrinkled across with
scars of the same form as upon the bark. The other specimen 64 bears
some narrow leaves, not quite 1 cent broad, scarcely narrowed at the point of attach
ment with primary veins distinct and close 4 in one millimeter or even 5 with one or 2
obscure intermediate veinlets and a rough bark like the other specimen. This
stem has only one half but a number of branches bearing Cordianthus or flower
like those of C. baccifer of Grand Eury. The outlets appear oval and some of
them at least are underlaid by a bracte. The racemes are simple the flowers on
++ outlets distant. Should be figured in parts. This species is evidently
distinct from the former. Conspicuous in C. Mansfieldi by the narrower
leaves, the close veins, very irregular in size and distance, the intermediate
veinlets obsolete. The cross wrinkles are also obsolete though visible. The bark
is totally different here than all and stead like the stem under it. A delo-
cheal fragment of the specimen 64 (see it at the corner) shows scars of three
pairs. They are true C. gemmifer like the one with C. communis
with longer scar than any of those described and figured by Grand Eury.
The lower part of the specimen should be figured as attached to the
stem a detached branch in figured Pl XVIII bis fig 2.

Sup. 534.

stone, formed of an outer ring with crenulate borders, and a comparatively large oval or elongated vascular scar in the middle. The double scars evidently represent the point of attachment of single leaves, which, if they had any analogy of form to that of their base, should have been one-third of an inch broad, with round sub-cylindrical borders, and a broad, flat, medial line. The surface of the trunks is regularly and finely wrinkled in the length: the scars transversely and still more finely so. The cicatrices, in descending towards the base of the tree, gradually change their form. They first become united into one, forming a deep triangular depression, with a single oval scar at the bottom, and further down in reaching the divisions representing their roots, they become round, with a central vascular point, exactly like those of *Stigmaria ficoides*, though a little smaller. The divisions of the stem, at first inclined downwards, become nearly horizontal at the broken extremities, distant twelve inches from the base of the stem. The largest and best preserved of these trunks is, near its base, four to five inches in circumference, dividing there in nine cylindrical branches, the largest ones seven to nine inches in diameter, merely forked near the broken end, which is two to three inches in diameter. The smallest ones, five inches across, are simple. These divisions, though marked with stigmaroid scars, appear indeed like roots, but it is evident that species of *Sigillaria* have sometimes grown in sand, and I believe that, under such circumstances, their subterranean divisions have somewhat modified their form, and hence they become similar to roots, as do the stems of *Utricularia* when they grow in sand. It is to this kind of organs or roots of *Sigillaria*, that the fragments described in this report are referable, under the generic name of *Sigillarioides*.*

From what is said of the relation of *Stigmaria* with *Sigillaria*, it is evident that though the forms of *Stigmaria* are much alike, and generally as yet referred to one species, viz., *S. ficoides*, Brgt., we have indeed as many species of *Stigmaria* as of *Sigillaria*. In his Permian, Prof. Goppert still describes *Stigmaria ficoides* with eleven varieties. I cannot see why differences, though difficult to appreciate, should be considered as specific for one genus and as a mere variation for the other. But botanical palæontology is a peculiar science. It offers to its adepts mere fragments of organs, whose relation to a whole is mostly unknown, forcing him either to generalize, and to consider in one species a number of organs which evidently pertain to plants of various kinds, or to specify and to divide under divers genera and species, fragments which, if not evidently, at least often apparently, belong to the same vegetable. It is not surprising that opinions concerning these remains are often at variance and often modified, or that the student of these fossil remains becomes discouraged

*I have never had an opportunity of publishing descriptions with plates of these remarkable trees. It may be done hereafter in the report of the Indiana Geological Survey.

by the sterility of his researches. And yet it is to vegetable palæontology mainly that we owe our acquaintance with the surface of our earth at the various epochs. From it we learn the character of the various changes which have modified this surface, and the admirable harmony of all the phenomena produced in its successive modifications. This branch of science has therefore a fascinating attraction, as it opens to our view the treasures of a vegetation that no human eye has ever seen or can expect to see, except in their fossilized fragments, and it shows us that all the divers epochs have been constantly working to the same end: the preparation of a home for the human race; and this work has been constantly pursued in admirable harmony under the direction of a Supreme Intelligence.

§ 6. ON THE STRATIGRAPHICAL AND GEOGRAPHICAL DISTRIBUTION OF THE FOSSIL PLANTS OF THE COAL MEASURES.

European palæontologists, who have especially studied the fossil plants of the Carboniferous strata, Brongniart, Goppert, Schimper, Geinitz, etc., have admitted that the distribution of these plants is modified according to the age of each bed of coal, and that, therefore, the horizontal position of the coal strata may be recognized by species peculiar to each. These views, as it now appears, (1) have been advanced on theoretical ground, or are based on local observations which cannot be considered as furnishing conclusive proofs; for local modifications in the succession of species of plants may be the result of mere local atmospherical, or geographical changes, which do not affect the characters of the whole flora, and therefore the comparative distribution of the fossil species of plants of an epoch can not be ascertained, but from the examination of this flora over the whole extent of its domain. A question of this kind can certainly be examined in our country with better chances of a definitive solution, than in any other part of the world, for our coal fields are of vast extent, the disturbances of stratification are rare or uniform, easily recognized by geologists, and the identification of the coal strata is ascertained at different localities from stratigraphical evidence.

From the beginning of my researches, in 1850, on the fossil flora of our Coal Measures, they have been pursued especially in view of obtaining positive data, marking changes in the vegetable constituents of each coal bed, according to its age, and therefore of recognizing species of plants peculiar to each (leading species), which would serve for their identification. As my views on the sub-

(1) From the authority of Prof. Brongniart, in letters, 1869.

ject have been published at different times, with the modifications induced by the progress of the researches, a summary of what is positively ascertained as yet on the stratigraphical distribution of the vegetation of the Coal Measures is not out of place in this Report. (1)

When researches are restricted to a limited area, or to basins of small extent, marked differences are recognizable in the species of vegetable remains in the shales, as well as in the essential vegetable components of each bed of coal. It is, then, an easy task to ascertain the relative position of the coal strata from the comparison of these remains. But when researches are extended over a wider area, changes of vegetation, evidently caused by geographical distribution, become more and more appreciable, some of the predominant species of a recognized horizon disappearing at some localities, and giving place to others of different characters. A glance at our table of distribution puts this in full evidence. The coal beds of Morris, Colchester and Murphysborough, the two first on the northeastern and northwestern, the last on the southwestern borders of the coal field of Illinois, are recognized, from all evidence, as representing coal No. 2, of the Illinois section, (in vol. 3, p. 6, of this Report) the equivalent of coal 1 B, of the Kentucky Report. (2)

Though the general character of the flora may be considered as the same, we find, by comparison of the species at Murphysborough, eight peculiar species; five only in common with Colchester and Morris, and twelve in common with Morris only, or altogether, eight species proper, and seventeen in common with strata of the same horizon examined elsewhere in Illinois. Colchester and Morris have been more carefully searched for specimens and are nearer to each other. They have seventeen species in common, while Colchester has nine species not yet found at Morris, and Morris has forty-four species, without counting those of Mazon creek, which, as yet, have not been seen at Colchester. The coal of Duquoin, considered as No. 5, of the Illinois section, and the only one from which as yet we have in Illinois and from a higher horizon a number of fossil plants which can be used for comparison, has eleven species proper, and seventeen in common with some or all of the other named localities. Points of difference and identity are therefore as well marked for this bed of coal as if it belonged to the same horizon as the others, and the same differences are observable in the distribution of common or more predominant species. For example, *Neuropteris flexuosa* is most abundant at Murphysborough, and has not as yet been found at Colchester and Morris, where *Pecopteris villosa* and *Callipteris Sullivantii* are the predominant species; and these are but rarely found, or not at all, at Murphysborough. On the

(1) See, on this subject especially, Penna. Geol. Rept., p. 837; Amer. Jour. of Sci. and Art, Nov. 1860.

(2) All these strata are here marked according to the Illinois section.

contrary, *Pecopteris unita* and *Pecopteris plumosa* are common at Duquoin and Morris, especially in the nodules of Mazon creek, and rare, or not recognized as yet at Colchester and Murphysborough.

From the examination of the table, one may easily see other points of difference between the species found at the same station, or of analogy between those of different horizons. Nevertheless, I am not, on this account, prepared to abandon, as an unsustainable hypothesis, the question of the stratigraphical distribution of the fossil plants of the coal, for the following reasons:

1st. In a theoretical point of view, it is scarcely admissible that at an epoch where the land surface has been universally, and at repeated times, modified by deposits, either of sand or of limestone, sometimes of great thickness, indicating a prolonged submersion, the flora, re-appearing after these terms of subsidence, has always been represented by the same species distributed in the same proportion. Atmospherical circumstances, indeed, are the essential agents in modifying the characters of a flora, and these circumstances have been apparently the same during the whole duration of the Carboniferous epoch. But the elements or components of the soil, or of the water where the plants have lived, have been evidently modified at different times, and even if the medium affording life to the vegetation had been repeatedly the same, some species of plants should have been lost or have somewhat changed their forms in these repeated and prolonged submersions of the whole surface of the coal fields. The destruction, or the first appearance of a species, either animal or vegetable, is the most difficult phenomenon to ascertain. Animal species, for example, seem to appear at once, and of far different kinds, in successive geological strata. But these strata are either composed of different materials, or have been formed in water of various depths, and under other varied circumstances. The changes of life, therefore, are local or casual phenomena, which generally represent a mere displacement of groups, and are of no account whatever in considering the first appearance, or the destruction of a single species.

2d. The fossil plants hitherto obtained from the Coal Measures of Illinois are mainly the result of local researches, too limited to serve as a basis for general conclusions, and it is only after more extended examinations, and more complete collections from other portions of the great area now occupied by Carboniferous strata in this and the adjacent States, that we may expect to obtain the data for determining, in a satisfactory manner, the distribution of the Caboniferous flora over the whole extent of our American coal fields.

3d. When this is done, we shall have sufficient proofs of a gradual change in the characters of the vegetation of the Coal Measures from the first appearance of land vegetation. The *Lycopodiaceous* plants, represented by the genera *Lepidodendron, Knorria, Ulodendron, Sigillaria*, etc., are already represented by

Plates with N:(

Pl. LVII

Figs 1–3. Alethopteris Emersoni Sp. nov. from a large numbe of specimens.
Figs 2d fruiting part with coaly spores destroyed. 2b same fruiting with coaly
S 28. of coal and spores. Ill. Rep IV p. 396 a. (2)

4, 4a. Alethopteris lonchitica Brgt. old plat from Cambridge specimen

5–2a. A. " Gibsoni Sp nov. N° 6 of Gibson spec. Ill. Rep IV p. 396 b (2)

Pl. LVIII

1, 1a. Goniopteris, Sp nov Gibson? sp. N 49. Ill. Rep IV p. 353 (3).

2, 2a, 3, 3a. G. arguta Brgt. 2. specimen fertile from Mazon creek Ill. 96. 3, 3a from the specimens in Cambridge Coll from Salem resp.

4, 4a. Pecopteris Cistii fro Brgt. (in part. But we have a numbe of specimens

5, 5a. " plat rachis Brgt. " " " "

6, 7. &7b. P. arborescens with fruitg. fragments, we have the species in large number then two specimens are from Middlewe.

8. 8a. G. oreopteridea. Brgt. partly fro Brgt. Very common

9 9a G. Miltoni-a polymorpha Brgt. " " "

10 10a G. Clarkii Dn. Ill. Rep. p 404 b. Ill. Rep IV, 404 b (2).

Pl. ~~LIX~~ LIX.

1, 1a Sphenopteris Newberryi, Lesq. from specimens in Cambridge & Cassville. This last has been left out. though figured.

1–2b. Sphenopteris muricata Brgt. Ill. Rep IV p. 395 b (2)

3. Pecopteris Illinoisensis. Brgt. refer this specimen by comparison to Pl. LVII fig 3.

4. 5. P. Serlii. Brgt. Ill. Rep. p. 395 b (4) with the former. — Compare Sphenopteris 2

6. Sphenopteris acuta, Brgt. apparently. Gibson specimen from Gray Creek N 29.

7, 8 Pecopteris crenulato Brgt. from Mazon Creek specimens. Ill Rep IV p. 352 (3) 353 (2), 392.

Pl. LX

Fig 1–3 Oligocarpia Gutbieri. with enlarged fruit copied from Geinitz or Göeppert see Ill. Rep IV p. 494 b Carb. note p. 38. N. 144

3–4 Dictyopteris (or neuropteris) polygramma? not described. ~~Figured from specimen in collection of Mazon creek~~

3–4 Sphenopteris lyrata foliis? Gutbier 55. 188 of Cambridge Herb. Ir 1664 both nodules from Mazon creek. Ill. Rep. IV. p. 407 b 3.

Continuing Pl LX.

60 Figs. 5–5b. Alethopteris Solida Lx. Ill. Rep. IV. p. 397. Pl. XI fig 5-7.
6–6b. Alethopteris stellata Lx. " II. p. 440 Pl. XXXVII fig 4–4b
7–7b. Staphylopteris stellata, Lx. Carb. Rep. II. p. 309. Pl. II fig 2–2b.
8–8b. " cerleroides, Lx. Ill. Rep. IV p. 406. Pl. XIV, fig. 6–7.
9–9b. " sagittata Lx. " " p. 407 Pl XIV fig 3–5
10. " ? a different species not described – fine specimen of Britts No 200 Differs by long stem and lanceolate pinnæ.

Pl LXI.

Fig. 1, 1a. Sphenopteris pseudo-alata (or another name) same as S. alata described in 2 Vol of Ill. Rep. p. 437. as described in mss. This species from Mazon creek, Ill Rep IV, p 407a
2–2b. Sphenopteris Brittsii Sp nov Ill Rep IV p 412 b. (2) & 412 c. (2) Britts No 99.
3–4a. Sphenopteris sp. nov. Ill Rep. as Alethopteris p 493 b 1. Ma 101.
5, 5a. " Hoeninghausii Brgt. not described. Large dyplotic spec. from Alabama
55 6. " elegans, Brgt. Ill Rep. IV p 407 b. (1). The specimen figured from Alabama.
7. " sp. nov? Al. 33. I do not find the species described. May be a var of Sphenopteris trichomanoides Brgt. see Carb Flora Sing. Ill Rep IV, 411 (
8–9a. Sphenopteris bidactylites Brgt & Fust. Spec. 6.3 of Britts. Ill Rep IV, 408 b.
C.B. p. 29. N 126. fig. 25 N 104.

Pl LXII.

1 Fig. 1. Calamites cannæformis, Brgt. Diagm of a large specimen
2–3 C. ramosus, Brgt. Stm. 466. C.B. p 16 N 46
3, 4 C. Suckowii Brgt. fragments.
6. C. Cisti. Brgt. from specimen of Lx.
5. C. approximatus Lx. Im 2/3 4
7 C. radiatus, Brgt. Copied from Brongniart.

Pl. LXIII.

Fig. 1–1b. Sphenopteris Dorteri Lx. Ill. Rep. IV p 448 Pl XXVII fig 4–b
2, 2a. " pachyderma, Brgt. Ad plate see expl. of plate Si 25
70 3–3b. " Pes Capreoli Gein. Trevorton Si 13 see expl.
4–4a. " cyclopteroides Brgt. N. ~~Ireland~~ Amherst College Si 11 see expl
5–9. " remotifolia Brgt. Of which Schimper makes 2 alternans in part fig 9 is from Lesley No. 452. see expl of plate

Pl. LXIV

Fig. 1. 2, 3. Sphenopteris elegans lævigata Brgt. Ill Rep. IV p. 481 c. 3. Lesley. N 481 (4
decorticated 482, 486
4. " Pittsburgensis (or another name) Ill Rep. p 480 b. 1 Lesley 48
71. 5. " marginata, sp. nov. Lesley 460 reverse. Ill Rep 4 p. 481 (
6. " Sillimanni Brgt. Lx. 460, 466. Ill Rep IV p. 480 b. 2.
7, 8. " triplicata Sp nov. " 466 Ill Rep IV p 481 c 1.

Pl. LXV. 2 da. 553 - 3 - 477.

Fig. 1. 4. Sigillaria tenellata Brgt? Ill. Rep. IV p. 448 c (2, 3), compare
5. 6? S. " manullaris Rep. " " 480 c (1) 5 - 461
72. 7, 8 S. " attenuata Lx. Penn. Pott. cat. p. 17. figures of the same.
9 S. " Lesquereuxii Schp. Lx. Schp. 2 p. 85.
10 S. " leiodermia, Lx. nov. Ill. Rep. IV p. 480 c (5) Lac. N: 497.
11 S. " Wolfii, Brgt. " " IV p. 480 c (2). " N: 494
12 S. " Lacoei. Lx. nov. " " IV p. 480 c (4) " N: 464

Pl. LXVI.

Fig. 1. Sigillaria polita, Lx. 1st Penn. Rep. p. 872. Pl. XIV fig. 3. copied,
2 " Gardneri. Lx. Cat. of Pott. p. 17. Pl. II fig. 4. copied.
73. 3 - 6. S. monostigma, Lx. 3 Mc. 116. 4. 67. 5. 201. 6 Ill. Rep. IV & XXV fig. 5.
7. " menardi Brgt. Gibson N: 17. Compare Ill. Rep. IV fig. 480 c (2)
8 - 16 c. S. Brardii Brgt. from a same specimen in Lesley Collection.
8. 9. 10 decort. 11 & 13 decort. 12 cort. 14 Rigmaria of
the same 15 cast of Rigmaria. 16. 16 a. leaf of the species.
Fig. 17. S. fissa Lx. 1st Penn. Rep. p. 871. Pl. XIII, fig 3 & 4.
18 S. sculpta. " " p. 871. Pl. XIII fig 3. = ? S. obliqua Brgt. var. ripley specimen
19 S. reticulata. Lx. Ast. Rep. p. 310 Pl. III fig 2, see Schimper.
20 S. " stellata Lx. 1st Penn. Rep. p. 871. Pl. XIV fig. 2.
21 S. " Schimperi, Lx. " " 871 Pl. XIV fig 1 copied

Pl. LXVII. (Should be Pl. III.)

Fig. 1 - 4. Calopteris (Neuropteris Bochriana) 1st Pa. Rep. p. 854 Pl. III figs 1 to 1d (copied.
49. 5 G. " (minor) Lx. " " p. 854. Pl. 1. fig. 10.
6 7. G. " (obtusa.) Lx. " " 854 Pl. 1 fig 11. Fig.
7 is copied from a Sketch from Rev L.
8, 8 a. G. " lucida, Andrew. Geol R. of Ohio. 2 vol p. 418 pl XLIX fig 2.
2 a. Fig. Copied in part.
9 9 c. G. " Alleghaniensis, Meek, Descriptn of new Brach. & Pal.
Sec of Warrington Dec. 1875. p. XVIII. Pl. 1 fig 2. (copied)

Pl. LXVIII

Fig. 1. Ulodendron elongatum, Lx. Ill. Rep. IV. p. 437 fig 4. copied.
2 - 2 c. U. " elliptic um Newb. Ill. Rep. IV p. 436. fig 2 = Pl. XXII fig 3
fig 2 a - 2 c = Pl. XXIII fig 1. 2. 3. copied both.
65. 3 3 a. U. " punctatum Ill. four specimens in Hildreth collection
Marietta College. Fig 3 reduced. 3 a. nat. size.

Pl. LXIX

Fig 1. Ulodendron minus Ill. & H. Ala. type. N: 19. Coal B. pg. N: 14.
2, 2 a. U. communitatum Schp. Ill. Rep. IV p. 435 b (2). Aldrich. N: 9.
66. 3, 3 a. U. majus. Ill. & H. upper surface 3 lower surface 3 a. copied from
Ill. Rep. pl XXII fig 4.

Pl. LXX

Figs. 1 & 1a, 2 Lepidodendron Britton Agy, Britt N 54 CB p 29 N 129
3, 3a & 4 L " spec. nov. ? Britts N 55 Paul B. p 20 N 82 - 32
5, 5a L " Sternbergi ? Mgt. L 23. Ill Rep IV p 428 & CB p 250
63. 6, 7, 7a L " spec. nov. ? L 206. Ill Rep p 428 & 21.
8, 8a, 9, 9a L " pinnatum Agy Ill Rep IV

Pl LXXI

Figs 1. Lycopodites Meekii Agy Ill Rep Pl XXVI figs 6, 6a. p 426 Lb. 1,
" 2, 2a. L " " ? " " p 426 & 1.

62. 3 3a Lepidodendron squamiferum sp. nov. P.M. 18. C.B. p. 9 N 18
4 Lepidodendron species not described see specimens. Britts N 201,
5 L " marginatum ? N. a quadratum. C-B N 70.
6 - 8 L " Wetherianum St. C. B. p 17 N 70 for figs 6 & 8. p 9 7. 7a species
from Ill Rep IV pl XXVIII figs 7, 8 ?

Pl LXXII

Figs 1, 1a Caulopteris Gifford, Agy. specimens in Col. NO Ill Rep IV p 458 & 3.
60 2. C. Mansfieldi ? Ma 92. Ill Rep IV p 469 & 1

Pl LXXIII.

Figs 1. C Caulopteris subnuda described as so named in Pal. Mex p. 17 f. 60.
" 2. C. " squamosa, Agy or another name not described Ma 394.
59 3 C. " punctata Agy Gein Rep p 869. Pl XIII, fig 8. 1.
4 C " ~~marginata~~ punctata Agy nov Ma 375.
5 C " angustata Agy nov (Ma 388 } not described
6 C " modesta or megastigmata ? not described Ma 113.
7 C. " magni Agy Ill Rep IV p 459. Pl. 49. fig. 2.
8 C. " obtecta Ill Rep IV p 457 Pl XXIIII fig 1

Pl LXXIV

1-2. Halonia tortuosa ? conjugata Lo Hist. C. B. p 21 N 84 p 38 N 143
61 3 Megaphicum Goldenbergi C B p 29 N 130.

Pl LXXV (not yet cut.)

56 1 Alethopteris (sphenopteris) speciosa Agy Ill Rep IV Pl 11 fig 1, 1a p 394
2. 3. A " (" hymenophylloides L. " p 393 Pl 10 figs 1-4
4 4a Hymenophyllites splendens L. Ill Rep Pl XIX fig 1. p 413.
5-5b Hymenophyllum Cornutum L. " " " 2. p 421

large tree in the Devonian of Ohio; in the Upper Silurian and Lower Devonian of Pennsylvania, (1) and occur in abundance in the Chester group (Lower Carboniferous) of Illinois. Representatives of this family of plants become more and more predominant in ascending, and by the number of species, and the size of the trees, the group attains its full development near the base of the true Coal Measures, at the horizon of coal No. 2. The bed of shale overlaying the Sub-Conglomerate coal of Kentucky and Arkansas, appears generally as a compound of mere debris, especially the leaves of *Lepidodendra*. This coal, like that of No. 2, shows also, upon its horizontal layers, distinct remains of plants of the same kind. In Pennsylvania, the shale of the mammoth bed, which I consider as the equivalent of coal 2, is, in places, a compound of large pieces of the bark of *Sigillaria* and *Lepidodendra*, superposed in a thickness of one to two feet, like the leaves of a book. (2) At Cuyahoga Falls, Ohio, the shale of the same coal is, in places, a mere compound also of pieces of bark of *Sigillaria*, and in Illinois, as seen by our table, the remains of *Sigillaria* and *Lepidodendra* predominate in the shale of coal No. 2, and the place of this coal in the sandstone of Marseilles is marked by remains of large trees of the same genera.

Ascending higher in the Measures, the Lycopodiaceous plants decrease in number to coal No. 5, or to the Duquoin coal, which, from its vegetable remains, appears to be the equivalent of coal No. 3. of the Kentucky Reports. This family is here represented still by some species of *Lepidodendron*, *Lepidophloios*, by cones or *Lepidostrobi* of large size, and by a few *Sigillaria* of the *Lepidodendroid* type, viz.: *Sigillaria sculpta* and *S. Brardei*, which appear to be universal species of the Carboniferous epoch. In higher strata of the Coal Measures of the United States, species of *Lepidodendra* have not as yet been found.

In connection with the Pittsburgh coal, as with coal No. 9 and No. 11, of Kentucky, I have seen specimens of the two last named species of *Sigillaria*, but no remains of *Lepidodendra*. From horizons above the Pittsburgh coal, we know nothing as yet of the flora of our Coal Measures. But in Europe, Goppert, in his flora of the Permian, enumerates *Sigillaria Brardei*, and describes two new species, *S. denudata* and *S. Danziana*, which are nearly related to *Sigillaria sculpta*, Lesqx., if not identical with it. The same work mentions also, as found in the lowest strata of the Permian Measures, *Lepidodendron Veltheimianum*, already present in the Devonian of Europe, and with us in the Lower Carboniferous limestones of Illinois, and with it he describes a

(1) Penn. Geol. Rep., p. 829, fig. 675, 677.

(2) A shale of this kind is, by an abrupt flexure of the coal strata, thrown up near Trevorton, and exposed as a perpendicular wall.

few species of cones (*Lepidostrobi*) of diminutive size, indicating there the disappearance of the large Lycopodiaceous plants which afterwards were not represented in any of the formations of our earth.

The fruits described under the generic names of *Trigonocarpus*, *Rhabdocarpus*, and *Ptilocarpus*, have as yet been found only from the Sub-Conglomerate coal strata upwards to coal No. 2. They abound in the Millstone grit and the hearth sandstone, as in the shale of coal No. 2. A few fruits of uncertain affinity, and considered under the name of *Carpolithes*, have been observed higher in the Measures; for example, *Carpolithes fasciculatus*, at Grayville, Ills. As yet these cases are very rare.

As to the ferns, the distribution at different horizons is more striking in considering certain groups or races, rather than peculiar genera or species. The genus *Neuropteris*, for example, is equally well represented, from the Sub-Conglomerate coal of Arkansas to the highest strata of Pennsylvania and Kentucky, by *Neuropteris hirsuta*, *Neuropteris flexuosa*, and *Neuropteris Loschii*, all species closely related by their peculiar nervation. These are, moreover, universally distributed over the whole extent of our coal fields, and in Europe two, at least, ascend to the Permian. From this group, *Neuropteris tenuifolia* is the only one which, appearing with the Sub-Conglomerate coal, has not as yet been found higher than coal No. 2. Another section of this genus, especially comprising species of a coarse or thick nervation or texture, like *Neuropteris Clarksonii*, *N. rarinervis*, *N. vermicularis*, *N. coriacea*, *N. pachyderma*, etc., is as yet truly characteristic of coal No. 2, none of them having as yet been found above or below it. All the species of the genus *Odontopteris* appear distributed from the coal strata under the Millstone grit up to coal No. 1 and No. 2. In Illinois, as in Pennsylvania, most of the species are found in connection with the last bed. It is the same with the species of large, thick leaved *Alethopteris*, *A. lonchitica*, *A. Serlii*, *A. Mazoniana*, *A. Massillonis*, *A. Owenii*, etc. They form, with *Callipteris Sullivantii*, a distinct and peculiar group, which may be considered truly characteristic of coal No. 2. *Alethopteris lonchitica*, has always been for me an essential leading species, and never, as yet, has misled me as marking the horizon of the mammoth vein of Penna. In the east, it is a most common species; it abounds also at Cuyahoga Falls, Ohio; but it seems to disappear in some basins, as for example in Illinois, where its place is taken by *Alethopteris Serlii* and *Callipteris Sullivantii*.

Of *Pecopteris*, the section which Brongniart separates under the name of *Sphenopteroides*, and which Schimper rightly places in the genus *Sphenopteris*, is the only one which may be considered as yet as peculiar to the lower Coal Measures. Its species, *Pecopteris Murrayana*, *P. chœrophylloides*, *P. Newberryi*, with *Sphenopteris latifolia*, *S. obtusiloba*, and *S. acuta*, are found in connection

Pl LXXVI[XXX]

Figs. 1–5 Asterosphyllites fasciculatus Ly. Mc Rep. p. 426 c. 2. Bulb spec. 110.
6. 7. " " oralis Lx. Rep. p. 426 c. 1.
3. 8–11. " " ? copied figures from Grand Eury
— 12. " " compare author. Specimen notable Mazon creek.
13 Annularia minuta? compare specimen from d'Clausville. Ennesa.
14 Macrostachya infundibuliformis Lhx. Rep. 491 a. 1. Mc 208.
17. 18 " " " " " "
19. 18a " " " " " "
20? 20. Asterophyllites equata Ly see Ben. Rep. The fig is copied from spec. of Mazon Creek Mansfield?
21–23a. Rotularia? not described. Spec. from Carrer of Penn.
24–26. " " " from Newcastle. Waverly.

Pl LXXVII

Fig. 1, 2 Lepidocarpon imbricatus Mc Rep. 463 c. (18).
3. " pectinatus " " 365 (3). Lacoe spec. 423.
4 " spec. ined see spec. when from.
5 " — ? quadrangulare Mc Rep. p. 365. (2). Stems of spec.
6, 7 " " ? see A described in Penn. Rep.
8. Lepidostrobus foliaceus? Ly Mc Rep. IV p. 440 d. (21) 444, 444 a. (1) Ly 199 on 171
9, 10 Lepidophyllum " ? Mc Rep. I p. 444 a. 1. Lx Ly. 1613. fig 111 in Ma 398.
11. 12. 13. 14. 15–17 Agglomeration of spores which should be described under — Genera name, macrosporites? fig. 11 is Ma 152a Fig 12 is marked 147. fig 13 is copied from Mc Rep. pl 31 fig 25 2a. fig 14 is 302 of Lacoe Sporocarpon rugosus, see further this Rep p. 367. fig 16 is 307 Lacoe. fig 17 is 301.
25. Lepidostrobus see L. bifolius this Rep p. 440 d (20). Pl. 60. compare Lesq. atlas. 59, 3
18–24. Carpolithes verticillaris referable to sporophores. see 18 = Lac. 206. 19, 20 & 23 as C. verticulari from Lacoe specimen under conglomerate 21–23 may be separated as C. parisiformis. 21 24 372 24a are copied from this Rep. pl 31 fig 22, 24
25. Lepidophyllum & Lepidostrobus see this Rep. 440 c. 20.
26. Lepidostrobus variabilis Mc HH. Ma 305
27, 28. Lepidostrobus bractatus Lx. Lacoe sp. 216. Mc Rep. IV p. 442 c. (2.)
29. L " oblongifolius Mc Rep. IV pl. 30 fig 3.
30 L " lanceifolius " " 31 fig 7, 7c.
31 L " carinifolius (not Lindleyanus or another name.) Lacoe spec. Mc Rep. p. 443 b. (9.)
32 L " ovalifolium from this Rep. Pl 80 fig 2b.
33 L " brevifolius copied and amended Ben. Rep. Pl XVIII f. 6.
34 L. Lepidophyllum Mansfield? dont find it described. in marker
L. undulatum Mc Rep. IV p. 440 b. (5). spec. Ma. 120.
35 L. rotellatum Ly this rep. pl 31 fig 8.
36 L " striatulum & striatum Mc Rep. IV p. 403 b (6).
37 L " acuminatum Lx Mc Rep. IV p. 403 b. (7
38 L. " maximum spec. in Lacoe.
39 L " linearifolium from my spec. named by Schimper
40. 41 L. " Morrisianum Lx. Mc Rep. p. 443 b (2) Lx 1611.

Fig 1. Trigonocarpum evoeggiathe Ll & Hutt. This Report Pl 31 fig 16.
2,3 T. " Daviesii Ll & Hutt. This Rep. p. 460c. 7. Sch. 529. 126.
85 5,6 T. " Gifforde, &c. not described see specimen 11 = 82.
7,8 T. " obovæformis. H.? This Rep. p 460c 6 (4)
9,10 T. " subcylindricum &c. " 460c 6 (5)
11 T. " Mengelianum Goep & Ren. 460c 6 (6).
12,13 Hexagleros germen, ornatum Newb (Rep Ohio) Rep. pl. 42 fig 7 × 7 a.
14. Rhabdocarpus clavatus. Kent. This Rep. pl 31 fig 11 & Ill Rep.
15 R. " cornutus &c. not described. two figures on T 29 not described
16 Carpolithes? bifidus? &c. This Rep. p. 462c (6) fig 3 p. 530 fig 8, 9.
17–19. C. " Lachnocarpus &c. 17 is var? comparable to C. Sedgwicki Kent. This Rep. p.
20. Rhabdocarpus clavatus? Rhab. Rep. Sm. 74.
21. R. " Mansfieldi &c. This Rep. p. 461c (5)
22,23 R. " Multistriatus H. see Newb. R. carinatus O Rep. pl 4 bis fig 2
24 " " Howardi &c. This Rep. p. 462c 4.
25 R. " Bochicanus? Goep. see also Trigon. ventricosum Sch
pl XXV fig 21 b. or Trig. Daviesii Ll. Ma. 130.
26. Carpolithes? insignis &c. Lacu specimen 373 not described
27 Rhabdocarpus amygdalæformis. N° 310 Lacu spec. not described see
C B. p. 23. N° 98.
28. R. " Bochicanus? p. 300. 75.
29 R. " platimarginatus &c. Artl Rep. pl. IV fig. 6.
30.30a R. " fasciculatus &c. Ill Rep. p 463c (20)
31.31a Carpolithes regularis H. Ill Rep. p 462c (10)
32. 33a Cardiocarpus mamillatus? Trig 32 may differ Ill Rep IV p. 463c
34,35 C. " ingens L & Artl. Rep. Pl IV fig. 4, 4a.
36,37 C. " annulatus? Newb. " p 461c (9)
39 C. " affine. &c. Artl Rep. Pl IV fig 5.
42. 43 C. " bicuspidatus H. & Gpt Rep. pl XLIII fig 9, 9a.
38. C. " ~~elongatus~~ irregularis Newb " " " 44
40 C. " orbicularis " " " 10.
41 C. " elongatus " " " 5
44,45 C. " tripli catus? change name. Ill Rep IV p. 461c 3.
46. 47 C. " simplex. " " " 461c 10
48 – 50 C. " clipeiformis? not described these are frondacæ spec.
51 Nilsoniopteris bicornutus &c.
52 Carpolithes rostellatus? see H. Ky Report not figured.

Pl LXXIX

Fig X. Fruit of Lepidophloios laricinum St. copied from Roemer pl XIII fig 1a. see also one in Goldenberg.
1. Lepidophloios macrolepidotum Gold. see from Geinitz.
2, 3 Cone of Lepidophloios (L. acuticulatum Le. this report Pl XXX fig 1.
4 Scale of the same " " Pl XXIV fig 1 in part.
5 Lepidophyllum acuticulatum of the same " " "
6 Lepidophloios with L. scales covering seeds. Ma. 318?
7, a, b Same " seeds in group " " 318
8, 8a Lepidophloios? from Britt N° 208 see what it may be
9, 9a L. " protuberans Le. this vol Pl XXVI fig 1-2
10 L. " ? may be a Lepidophloios Le. 1611. see Pl fig 10
from Lilly Bill at Swilden's shingles?

Pl LXXX

1 Lepidodendron aculeatum St.? see for specimen in Berg. I do not know where it is from
2 L. " displosa vicies Le. Hartt Report. p. 311. (correct)
3 L. " obovatum? see specimen & compare.
4 L. " costatum. Le. Ill. Rep. II. p. 453. Pl. XLIV fig. V.
5 L. " turbinatum Le. " " " 6
6 L. " ? see specimen from Mexico.
7 L. " Lacoe 717 see 718 cont.
8, 9 L. " Worthen. Ill. Rep II p. 205 2 Pl. XII fig. 4.5.
10 L. " distans Sigill. Ge Rep I pl XVI fig 5.
11 L. " rimosum St. see about specimen.
12 L. " Mischki. Goep. Compare Goep Syst. pl. XLIV fig 2 and see for specimen where from.
13, 14 L. " modulatum Le. Hartt Rep 2 p. 311 & Rep 6 p. 876
15 L. " rectatum Le. Dawson Rep. p. 474. Ill. Rep 1 p. 428. specimen where from?
16 L. " clypeatum? specimen unknown to me? I can 16 a & 16 d. belong to 1 or 2 as I remember
17, 18 compare sequence of Stimberg may be referable to 16.

Pl LXXXI

Fig 1. 2. 3. Calopteris minor Sig. 3 & 3a. from Joggins specimen Lacoe 695 Saporta me fait part de remarques
4. " " "
5. " " hybernica L. 697. Saporta dit qu'elle ne diffère pas du très petit des C. hybernica veritable
6. " " Lacoeana Mell figure cut for Mell
7. Hymenophyllites Sp. nov. Spec Lacoe 699. Saport. la considère comme un foliole de Sphenopteris Sphenopteris pachyrachis de Goepp. Selon. Voir la note letter de M Smith. He is with the Cordaites

Pl. LXXXII

Fig. 1. Alethopteris Gibsoni Ld. Ill. Rep. IV p. 396 f. 1, 397 f. 2. Drawn & taken from a very large specimen of the Agricultural College of Ohio lent by Prof. Orton
33 Same specie figured pl. XXVII.
2-5. A. " obtusa (?) or call the name, marked subtruncata in the vol. p. 397 f. (1), all the specimens, and those some more now are from Mansfield, Penn.
6-8. Alethopteris Owenii Ldy. Fig. 6, 6a. copied from the Ill. Report, fig. 7, is what I prepared for My Report on the Coniana which I think the same Fig. 8 8a is A. Shaffer from another specimen from the high coal Anthracite of Pa. a 8 is the enlarged part of the penn in Tottenville Catalogue, made from the specimen at Cambridge Mass
9, 9a. A. inflata copied from the Report. pl X fig 5 & 6.

Pl. LXXXIII

Fig. 1. 2. 3. Pecopteris pseudo-neuropt. spec. nov. Ill. Rep. IV p. 398 f. 3.
4 5, 4a P. " elliptica Bunb. " " 400 f. 2 " "
39. 6, 6a " " " fructified part " "
12, 13. ~~7, 7a~~ P. " squamosa Ldy copied from this vol. pl XLV fig 10. in part ~~pl XLV~~
14, 15 ~~9, 9a~~ C. " Newberryi Ld. " " Pl. XIII. fig 7-9.
7, 8, 11. 12 Goniopteris lobulosa sp. nov. Ill. Rep. VII p. 354 (1). 685 da dau
9, 10 ~~5, 5a~~ Goniopteris lanceolata Ldy. Ill. Rep this vol. pl XIII fig 1-3
11. ~~5~~ " emarginata, Goepp. " " " " 4.

Pl. LXXXIV

Fig. 1. Stigmaria ficoides. reduced see Göppert. Ur. 1-2 Pl. IX fig. 6 also Ldy Report IX & X
2, 3. 4. 6, 8 " " " "
74 5 " " I do not recollect. found out!
7 Stigmaria ficoides Hellaria Ldy. & this vol. Pl XXX fig 3
9. Halonia Tuberculata Byst? " " " fig 1.
10. Sigillaria ? Brodbeckii Copied from Owen specimen. 10a & 10b. natural size
11 Stigmaria in place " from Schimper Ves Val. Pl LXIX fig 2
12. 13 Rootlets or bases of Stigmaria with tubercles 12 from small specimen 13 from Midges Mine
14. Halonia imbricata. which Copied in part from Goepp Gatt. Ur. 3, 4 f
15 " " from Ill's Report. "

Pl. LXXXV

1 Stigmaria Owenii Ldy Ill. Rep. II p. pl XXXIX fig. 9.
75 2. Stigmaria ficoides Truncatus Ld. " IV pl XXIX fig 4
3. " " Rhodus " " XXXI fig. 1.
4 " " fibrosus " " XXIX fig. 5
5 " " lineata " " XXXI fig 2.
6. Sigillaria ficoides radicans " " " XXVII " 4
7. Stigmaria ficoides affinis Ld. " " " XXVII " 9
8. " " Delage Ld. " " " XXXI " 3.

one

with coal No. 2. *Hymenophyllites furcatus* has more generally been found below the Millstone grit, but it ascends, though rarely, to coal No. 2, where also *Hymenophyllites splendens*, *H. Schlotheimii* and some other species of the section *Aphlebia* are generally found.

As representative of the higher coal strata of Illinois, or of coal No. 5, there is no particular species to quote. *Alethopteris aquilina*, with *Pecopteris unita*, *P. plumosa*, *Cordaites angustifolia*, and species of *Lepidophloios*, are there represented by more abundant specimens than anywhere else, but remains of these plants have been also observed in the lower Coal Measures. In the anthracite basin of Pennsylvania, the highest strata are recognized by the presence of *Pecopteris arborescens*, which has not been as yet positively discovered in Illinois, the small specimens referred to it from a nodule of Mazon creek being too obscure for certain identification. This species, the most abundant of all in some localities of Pennsylvania, is found also in profusion in the red clay beds of Ohio, especially in the *grotto of flowers*, near Marietta, where it is represented by a slightly different form, perhaps a mere variety of *P. rubra*, Lesqx. In Europe, it ascends to the Permian, where its characters, though somewhat modified, have been considered as specific by Goppert, who has named it *P.* (*Cyatheites*) *Schlotheimii*. It is there, as with us, associated with its large form *P. Cyathea*, Brgt. The section *Cyatheites* of the genus *Pecopteris*, is, indeed, of all the fossil ferns of the coal, the one which is, in some of its species, characteristic of the higher coal strata. But as yet these species are indifferently known, and therefore it is hardly possible to indicate them as peculiar to a certain horizon. For example, *Pecopteris polymorpha*, Brgt., abounds in the highest coal strata of Illinois at Grayville, and near New Harmony, Ind. It is generally like *P. arborescens*, a marked species of our upper Coal Measures, while *Pecopteris abbreviata*, which Prof. Geinitz takes as a mere variety of it, is common at Morris, Mazon creek and other places, always in connection with coal No. 2, and has not yet been observed in higher strata. The differences in these horizons, as well as in the form of the pinnæ, indicate these remains as representing two different species, though the nervation is of the same kind. It is certain that, as the Lycopodiaceous plants of the coal decrease in the number of their representatives, as in their size, in ascending in the Coal Measures, they are proportionally replaced by ferns, either herbaceous or arborescent. This change is everywhere evident in the shale overlaying the coal beds, as in the coal itself. At Grayville, and especially at Springfield, Ill., where the upper coal is nearly 200 feet above coal No. 5, the lamellæ of the coal bear a quantity of recognizable leaflets and branches of ferns, especially of the genus *Pecopteris*. The roof shales of the Pomroy coal in Ohio are thickly covered with remains of ferns, especially large pinnæ, still bearing leaves of *Neuropteris flexuosa* and *N. hirsuta*. A bed of shale,

which in places underlies the Pittsburg coal, is also a mere compound of stems and leaves of this last species, and I have received from the highest coal bed of Kansas, which is considered by some geologists as belonging to the Permian strata, a large lot of specimens of the roof shale, which, like those from under the Pittsburg coal, contain leaves of the same *Neuropteris hirsuta* heaped in profusion, without any other species but *N. Loschii.*

From the horizon of the Pittsburg coal, we have from Pennsylvania two remarkable species, whose discovery is due to the sagacious investigation of Rev. D. C. Moore, and which, by their characters, appear related rather to species of the Permian, or even of the Oolite, than to those of the Carboniferous epoch. One is the peculiar *Neuropteris Moorii*, Lesqx., Penn. Geol. Rept., p. 860, Pl. xix, fix. 1,* related by the pointed form of its leaflets and their size to *Pecopteris Whitbiensis*, Ll. and Hutt., of the Oolite of England. The second is apparently a species of *Schizoneura*, a new genus of Schimper, represented as yet by only four species in the Trias and the Oolite of Europe. Our species is known only by small branches, one-fourth of an inch broad, striated lengthwise, like those of a *Sphenophyllum*, articulated at short distances, bearing at the articulations whorls of ten to twelve oblanceolate obtuse flat leaflets, about one inch long, marked lengthwise by parallel thin veinlets. These leaflets appear distinct or unconnected to their base, which is marked by small, circular, distinct scars. No trace of a vagina has been observed as yet.

The presence of these peculiar plants in the higher Coal Measures of Pennsylvania may not be more conclusive, as indicating a distinct geological horizon, than are the numerous remains of insects, crustaceans, etc., discovered in the nodules of Mazon creek, and which have as yet their relatives only represented in the Permian. But I desire to make here only a record of facts, according to our actual knowledge, in regard to the flora of the Coal Measures, and leave to future discoverers the task of obtaining more reliable data for a definitive conclusion on the subject.

The examination of the geographical distribution of the flora of our Carboniferous strata, according to the suggestions of Prof. H. D. Rogers, in the preparation of the Pennsylvania Geological Report, proposes the solution of these three questions: 1st. What is the geological relation of our Coal Measures with those of Europe, in considering the vegetable constituents of the strata in both continents? 2d. From the same kind of researches, is the anthracite basin of Pennsylvania identical in its age and in the distribution of its measures with the great Apalachian bituminous coal basin of Ohio and Pennsylvania? And as a corollary: 3d. What is the geological relation of the sepa-

*Prof. W. P. Schimper has separated this species as the type of a new genus *Lescuropteris*, a separation already indicated by my remarks with the description of this species, loc. cit.

Pl XXXV continued

9. Rhizolithes palmatifidus &c. Att. Rep. Pl V. fig 9.
10. Tachypteris gracillima &c. Ht. Rep. IV pl. XIX fig 6.
11. Taleomyris (Spirangium) plicata sp nov. From Specm Di 104 Ht Rep IV p 464 & 2.
12. " " appendiculata &c. Ht Rep IV p. l. XXVII, fig 11.
13-15 b. " Dendeliti &c. " " " pl. " " 10-12.
15 c. Part of the same enlarged to show surface
16. Calamodendron. ? compare & descr. Specim of Mansfield 361.
17. Calamites gracilis Brongt. Hy. Report. p. 436. N. vol IV.

Calamites ramosus, Stur, Ma 481. a fine specimen both C. ramosus Brgt. but with the bar of the ribs converging distinctly to the scars of branches which are very small. This convergence is marked in C. approximatus fg. by Schimper Atlas but not in Brgt.

rate coal basins of Western Kentucky, Illinois and Michigan with our eastern coal fields? The first two of these questions have been examined and answered in the Geological Report of Pennsylvania, pp. 839–842. Though new discoveries might now furnish some interesting details to the discussion, nothing has as yet been found in the Coal Measures, which might tend to invalidate the conclusions admitted in that report. The third question has been also considered* from data obtained in the geological explorations of Kentucky, Arkansas and Indiana, and therefore I have but to add here a few remarks which are called for by the species recently found in the Coal Measures of Illinois.

We cannot expect to trace any marked differences indicating climatic divisions from the northern to the southern limits of the coal fields of Illinois. Local changes, as indicated from the table of distribution, can but be considered as casual, and not ascribed to any permanent or general thermal influence.

The relation of the Coal Measures of Illinois with the eastern coal fields of Pennsylvania, Rhode Island and Nova Scotia, is indicated not only by the common or more predominant species, but also by some rare and striking ones. The coal of Morris, for example, has, in common with that of Newport, R. I., *Pecopteris squamosa*, *Pecopteris unita*, *Odontopteris Schlotheimii* and *Asterophyllites lævis;* with the low beds of anthracite of Pennsylvania, *Callipteris Sullivantii*, *Neuropteris fimbriata*, *N. rarinervis*, *N. Clarksonii*, *N. Desorii*, etc., and with the Coal Measures of Nova Scotia: *Odontopteris subcuneata*, a species not seen as yet in any other part of the coal fields of the United States. Some species of the eastern basin, like *Neuropteris Rogersi*, Lesqx., *Odontopteris alata*, Lesqx., *Alethopteris obscura*, Lesqx., *Whittleseya elegans* ,Newb.,etc., have not yet been found in Illinois; but these are very rare species, discovered each at a single locality, as are some of the new species described from the coal fields of Illinois, and which may be found elsewhere hereafter. Illinois has likewise about 30 species known in the coal flora of Europe, and which have not been yet seen in the more eastern coal fields of America.

Of the common species of our eastern coal fields, not yet found in Illinois, none can be quoted but *Dictyopteris obliqua*, Bunb., locally abundant in the shale of the high coal near Pottsville, Penn., of Newport, R. I., and of the subconglomerate coal of Arkansas; *Sphenopteris artemisiæfolia*, Brgt., rare everywhere, sparingly found in the low beds of the anthracite basin of Pennsylvania and of the western coal fields of Kentucky; *Pecopteris arborescens*, already quoted; *Pecopteris Loschii* and the peculiar *Brachyphyllum obtusum*, Lesqx., both locally predominant in the anthracite fields. The near relation of the coal basin of Illinois with the other coal fields of this continent, is thus demonstrated by its fossil flora.

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*Journal of Science and Art, July, 1860.

The number of European species recognized in the Coal Measures of Illinois do not change in any way the relation of the American Coal Measures with those of Europe. It remains now the same as I have presented it formerly (Penn. Geol. Rep., loc. cit.). If general affinity is ascertained by a large number of plants, either identical or closely related, geographical differences in the vegetation are indicated by peculiar species or races of ours, which as yet have not been observed in the Coal Measures of Europe. It is true that European palæontologists, though at work on the coal flora for more than a century, still discover species, either identical with or allied to some of ours, which were once considered as exclusively pertaining to the American coal flora; for example, a fimbriate *Cyclopteris** from a small anthracite basin of the Swiss Alpine mountains. But these cases are very rare indeed, and besides what is known from other parts of our coal fields, Illinois has now furnished a number of these peculiar types of vegetables, which render geographical disparity more appreciable. Of this kind are especially *Neuropteris verbenæfolia*, *N. Evenii*, *N. pachyderma*, *Dictyopteris rubella*, *Alethopteris hymenophylloides*, *A. inflata*, *A. solida*, *Pecopteris Strongii*, species of *Staphylopteris*, *Sphenopteris scaberrima*, *Hymenophyllites mollis*, *Schutzia bracteata*, a number of species of *Lepidodendra* and *Sigillaria*, *Syringodendron Porteri*, *Megaphytum McLayii*, species of *Caulopteris* and of fruits of *Palæoxyris*. Indeed, no genus of our coal flora, except, perhaps, *Calamites*, can be considered as represented on both continents by species all identical or closely allied. As these points of difference, like those of affinity, have been observed from the beginning of the researches on the coal flora, and have not varied much in comparative quantity, they appear to fully corroborate the statement that, at the Carboniferous epoch, the flora which formed the constituents of the coal, was in Europe and in the United States as different, and at the same time as relatively alike, as is now the flora of the peat bogs of the two continents.

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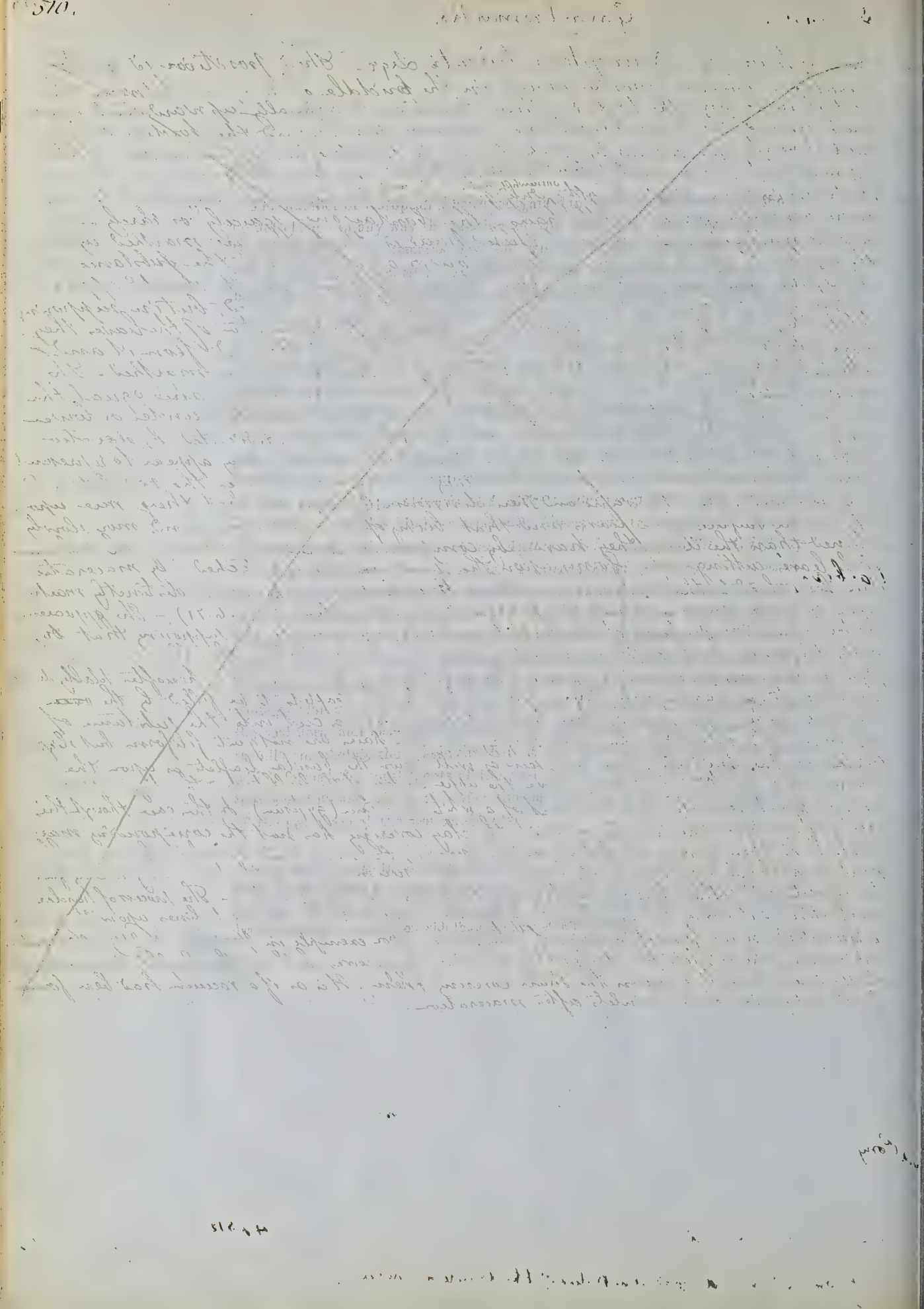
* *Cyclopteris lacerata*, Heer., see descriptive part. The predominant species of this Alpine basin, which was for a long time considered as of a different formation from that of the Carboniferous epoch, is *Odontopteris Alpina*, Brgt., a peculiar plant, which, as yet, with us, has been found only in connection with the anthracite of Rhode Island.

General remarks.

1. The hairs of Neuropteris hirsuta Lqx. Their position is quite irregular. They are mostly placed in the middle of the space between the medial nerve and the borders. Their direction is generally upwards but varies much some of the hairs being turned more or less toward the borders or the medial nerve ever but rarely perpendicular to the direction of the borders. Their form is that of very small short needly about one line in length, of the same thickness in their whole length somewhat thicker in the middle, only pointed at the top. The large leaflet are more generally covered with hairs, the basilar ones scarcely or rarely. The more remarkable appearance of these hairs is that they are marked upon the surface of the leaves by a depression or as if cut into the substance of the leaves and not as placed upon by an elevation as it should appear if they had grown upon it. This can not be explained, but in supposing that they were of a harder substance that by the maceration of the leaves they have penetrated the parenchyme and have become covered from it and attached to the clay where the counterpart of the leaves is marked. The hairs marked upon the upper part of the leaves are so deep and equal that it is not well possible to suppose that the hairs were upon the under or lower surface. for if it was the case their presence should be indicated by elevation of the surface and not by depression. Though it may be, they appear to represent hairs. They cut across the veins traversing 6 to 7 under between the veinlets and originate mostly from the veins and their divisions. It can be that they were upon the under surface of the leaves, and that being of a hard texture and more slowly softened than the leaves they have, by compression penetrated through the substance of the leaves cutting their forms upon the leaves and being detached by maceration have been glued to the clay covering the upper surface. They are so distinctly marked upon the clay covering that the supposition is admissible. (21.6.71). — The appearance marked upon the surface of the leaflets would be explained also in supposing that originally the hairs, being on the upper surface and of a harder texture than the leaves were first by compression imbedded into the substance of the leaves and thereafter totally destroyed by maceration leaving only their place cut into the leaflets to be filled by the covering clay. The scars of these hairs appear indeed as cut into the substance of the leaves and often sharply and deeply so. The hairs are not quit filiform but slightly thicker in the middle. They are seen as well upon the basilar leaflets as upon the large ones. — Some specimens have the upper surface of the leaflet and the clay impression resting upon it separated by a thin coat of a white substance (gypsum). In this case though the upper surface bears the prints of hair the clay covering has not the corresponding marks in relief. It then appear as from another species, the veins and veinlets being well marked without any trace of hairs. Better specimens show the hairs originating from the veinlets and rather turned backwards than towards the point. — The process of harder penetrating substances being marked by grooves and not by upraised lines upon the surface is remarked in the form of the veins of some species. For example in specimen N. 214. Neuropteris rarinervis, the veinlets are distinctly marked by grooves both in the leaflet themselves of the specimen as well as upon the shale covering them. It is as if a raceum had been formed by the destruction of the veinlets after maceration.



1. Brongniart remarks in (Rapport sur les memoires de Grand'Eury) p. 2. that the Carboniferous formations are not referable to a single epoch but that one has recognized in them six different geological positions which equally offer marked differences in the ensemble of the plants which have formed them. To speak merely of the carboniferous measures of France, one has to admit that those of the West including the department of Maine & Loire & Sarre inferieure placed at the upper limit of the Devonian formations are the most ancient; that those of the Dep[t] of the North (Dep du Nord) which appear contemporaneous with those of Belgium, England and most of those of Germany come after and that those which surround the central massif of France as more recent and in some cases only (Commentry) to the Permian which is the upper limit of the Carboniferous. See same Mem: that these upper carboniferous measures show different epochs by their plants or different stages. See on this subject Grand'Eury remarks in Brongniart Mem. p 19.

I have frequently abstained of multiplied comparisons of our fossil ferns to those of Europe over the attempt made by divers authors and the extraordinary differences of their opinion in regard to references of this kind, thus for authors like d'Eichwald, Schimper, Brongniart etc who had in hand all the materials of value for a comparison of this kind is sufficient to prove how little we know as yet of the true characters of the ferns of the coal in comparison with those of our time. Desirous as I am of sufficient means of comparison to attempt this kind could have been but an exhibition of personal views without any useful result. Moreover I leave for those who, like Grand'Eury, is prepared especially for the study, have no means of comparison and for the authors in their valuable works they will have opportunity of making numerous comparisons with more advantages than I have only the wish to represent faithfully the plants a fragment of those of the U. S. Coal measures and thus afford a supply of reliable materials for those who may continue this study on these researches from a more elevated & scientific point of view.

Remark for the reproduction of certain figures for the Ill[s] Report especially: that the figures have been very carefully drawn by myself and beautifully engraved by the Heliotype Engraving Company of Chicago that most of the specimens were lost for representation were the property of the Ill[s] Geol Survey and preserved in the State Cabinet of Springfield a loss to all geologists especially that both the Ill[s] cabinet and Survey have been burned and most of the specimens lost and that also the steel plates of the Survey have been destroyed in the Great Chicago fire. (see 4 & 512)

3 On the quotation I have merely quoted in the 1[st] by numbering or reference the earth original author whose which have good illustrations of the described species. See N°8 same remarks.

4 It is only regrettable that the number of plates and figures could not be greatly increased. At least double the number of plates would have been necessary to satisfactorily represent all the species described. I have tried to compensate the absence of figures by careful more detailed descriptions but no description is equivalent to a figure. Even as for the ferns, a single species to be described in all its essential characters would need many plates. I have therefore in the selection of plant figures endeavoured to give a good representation of the flora of our coal measures. The blanks to be filled may be hereafter by figures as a supplement to the flora.

5 I have especially reproduced figures of the fruit a number of organs not of known from the Nodules a Concretions of Mazon Creek. From their character and from the fact that a number of the species which they represent have not been found elsewhere, it appears that organs of soft tissue generally destroyed by maceration or compression in the shale have been preserved at Mazon Creek and from the researches pursued for years by Mr. J. D. Sherz. For one or other it is not probable that remains of other forms may be found hereafter. They are of peculiar importance in demonstrating the variety and richness of the coal flora and also the fern nature of part of that flora. For example the Rachopteris Rhizomopteris, Sphenopteris &c. have all without exception been found in these Concretions also most of the finely preserved fragments of ferns

6 Some fragments like those described as Stig marioides may seem of too obscure character to merit a description. These remain do however extremely rare, representing organs generally destroyed by maceration. They help to give us a clue to the mode of existence of the coal plant and nothing should be omitted in these works which might relate to the Carboniferous flora and explain some of its characters.

7. The fossil plants, like known merely by fragments which rarely give an idea of the true characters of the vegetable which they represent. They are riddles, hieroglyphs which phytopaleontologists are called to decipher or explain and what are generally differently explained by the student. I am not at all disposed to enter into discussion on the value of the so called species which I adopt for the description of the fragments which I have studied. And I gladly leave to every one the privilege of contradiction my own or my opinions. For in a field like phytopaleontology

8 I have given with the specification the more important synonyms especially mentioning the authors whose descriptions are illustrated by figures. A number of species are not figured (say why) some of the more important figures are found in Schimper Palaeont. Veget. a work now in the hands of every phytopaleontologists.

9 Scars of branches of Rhizomopteris and of Macrostachya also Fibrascina of Calamites are preserved separately in coal that

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10 In the Cannel Coal the Sigillaria are very rare the
Macrospores and Lycopodiaceæ capsules very abundant.
11 Neuropteris species appear more abundant on the coal measures of this Continent
than in Europe, not only for the number of species but for the development
of the species.
12 Perhaps the comparison made on the characters of some of the Amer-
ican species to those described by the authors may seem too long
and tedious for details. As we have no European specimens for comparison
these details are necessary to allow the study of the specific characters
which the base power us to a separation or to a identification of species.
13, There are in the Neuropteris such a variety of American forms and
a diversity of peculiar characters forcing them distinctions in a large
number of species that at first sight this multiplication may
appear unreliable and perhaps condemned in that way by European
authors in the beginning of my researches. But with after a while
a number of specimens especially when specimens quite thin, the
doubt has entirely disappeared and with few exceptions easily
remarked by myself all these species are now acknowledged
as remarkable by peculiar at least until now to the Am. Coal
Measures. Should we think that this great variety is limited
to the genus. What we see of the Lycopodiaceæ fructification
of the Cordaites specimens is sufficient to indicate that for
the introduction of these a too large number of uncertain
species I have been by far too conservative and the whole
or how materials except and peculiarly characterized so for
as any new distinct generic and specific subdivision will be
established hereafter.

Though the flora descriptive and perhaps will represent hereafter
all the species known until now for the Carboniferous and may
therefore supply the wants of specimens the numerous works which
treat of the subject, I did not think proper to omit the
nomenclature and the reference to the books which have
been used in the preparation of the flora. The references may
show the one necessary; they serving also then to be indicated
of Coal in the most important data in order to know
the true means of the species and to afford means of comparison
of what we have described to what is known in Europe etc.

to p. 315

Warm plants in the Carboniferous

See description of the species of which I have given some figures in Pl. I.

Sycophycus or Scyphothea. I suggest this generic name for the description of the following plant of which I have received a specimen from Prof Broadhead. The plant represent a semi-spherical or obovate cup, like a ball cut in two, rounded downward to a branch or axis upon which it is supported, the axis developing on three branches as a support of the cup whose borders outsides are elegantly marked by upward ridges branching and flattening up toward the borders, or rim ornamenting the side of a cup. The upper part is concave, the borders convex. The diameter across the border is 8 cent. and the axis or pedicel is nearly 1 cent thick. The cup appears as half filled by inorganic matter; the thickness of the border is nearly 1 centimeter. Of this organism Prof Broadhead writes in his letter Dated 11. 1878 "That he has these kinds of plant in much smaller specimens or in diameter from 1/2 to 3 inches. Of one he sends is the only with a well defined stem or axis. Their position is in nests or on top of others as you could set a dish on another with cavity upwards but most of them were found singly or one or two together. I have three small ones just as they occurred in shale most of them have 5 or 6 well defined ridges extending from axes to margin. There also have lesser ridges attached but some have not ridges at all. The interior is smoothly lustrated with no particular ornamentation only the border place where the overlying cup was attached as it rested or axis more properly called axis because it connects several or rather one to that above. When no cup is above, the cavity is filled over evenly but probably would be cut out. I have only found them at the locality where they abound." The Coal measures in Vernon Co. Mo. In shale near the base of the Coal measures in Vernon Co. Mo. about half way between Nevada and F. S. Scott.

16. See and examin somewhere that quarter of the species of the coal which we may consider as ancestors are not generally the more fully developped that which we may consider as descendents. As Alethopteris grandifolia A. mucronifolia A. Grandini &c of Newb[erry] & Andrews. pecopteris A. serlii, aequalis &c. then pecopteris the Dentopteris may also Dictyopteris, be less a succeeding Neuropteris &c. For the Alethopteris Dictyopteris. For the Lepidodendrons of Lycopodiaceae &. Veltheimian. for the Sigillaria. etc etc

I know that the work will be looked at as defficient in many points. But I can answer for it that I have prepared it with a book as I should have wished to find it when I began my researches as a director in entering upon the carboniferous flora. It is for this reason that I had to enter into considerable two long descriptions of species or specimens and also into the character of some of the genera or other groups in order to afford the American reader unacquainted with Calcareous Fossils the explanation sufficient to enable him to understand the work. The species are often described not merely in the figured specimen but upon the consideration of many fragment of one of which only perhaps is found by the Paleontologists and he has to understand the whole form under which a species may appear.

17 A more elaborate discussion and classification of the character of the species is forced to the deficiency of means of comparison with Europea species considered identical or perhaps different for some specific character. Also as that for those years that I have been collecting materials pertaining to the coal flora and studying either the place where they were found or in the mines attached to the work or in the cabinet, I have not a many fragment of a new plant and recognized the difficulty of recognizing the generic character from one or a small number of specimens that I am forced to expose the different forms remarked and then to send them together in order to give a full representation of the coal flora overall description volume by Plate. But this is as the largest work a Coal plant has nearly two hundred plates given to the and the exactly text. Even then many are of the coal plants

18 lengthy descriptions forced by the deficiency of the figure and the necessity of remarking upon those characters not represented by drawing. I by total absence of Europea materials for comparison of species by authentically referred to Europea or Unknown fragments or figures of authors. By the almost impossibility of procuring a representative of the American coal flora clear enough to supply the numerous partial wants of authors in Coal flora. Bound what says. Lesquereux in the discouragements he fleets in the accumulation of the coal. Also by the fact that observers and searchers

specimen of the coal flora during a space of time I have constantly annotated the specification by remarks upon all the peculiar varieties recognized in specimens.

19 It will not be amiss to remark that I have here described some fragment of fern whose attribution is not certain even acknowledged by myself as to or correct. I have done it only to give an exponent of the materials which have been observed and studied in my long explorations of the coal plants of the N.A.n. Perhaps these fragments may be found representing in better specimens and their relations ascertained. I do not consider any fragmentary fossil plants unworthy of observation or remark and I am indifferent as the uses which can be made of my descriptions (see Carmel fern Pennsylvanian Newspaper fern; cf. memoir. #19a.

20 Except that this flora represent a number of coal plant of type specific or generic type unknown in the Devonian by me in the Devonian coal flora. I do not intend to treat any thing of the character of the plant to European Paleontologists who would consider it as an author who has not ever had the opportunity to compare American specimens with those of Europe. Who is deprived of the means of studying fossil plant for anatomical analysis to put his opinion in contradiction to those of the celebrated authors whose works few who have access can give and have to have research. The aim of these flora is to represent the American vegetation of the coal as it has been by the exploration of a long series of years. Museums are the whole calculated the coal fields. To give them the means of becoming acquainted with this flora flora to all who are interested in to produce type is all the question pertaining to the coal. to the mine, the properties of cabinets or museums the geologist. etc.

19a And also, I have described these uncertain species for specimens whose reference is given by No to the different cabinet where they can be studied and compared. The flora is described as fully as possible as I have seen it and as I wish I had had a book to direct my researches when I began the study of coal flora

21 Now what is left to future Paleontologists friends of the coal plants is not merely to correct the errors which this book contains and which certainly numerous but to fill the lacunes in complete the description and give a better acquaintance of the species chosen of the genus and of their relations. To essentially examine and carefully record the local flora either for geographical or chronological comparisons of the species (distribution etc. This knowledge is very difficult but now when can we expect to find material more appropriate or more numerous than embedded / more numerous for research of this kind

22 I have described in the Coal flora species connected by Prof Dawson as Devonian of the separate of the coal flora with the Devonian is not positively marked species of the Catskill group. Not being lastly now considered as Devonian Nor the species of Coal beds in their formation forces their dependence the Carboniferous and of Coal beds in their formation forces their dependence the Carboniferous and so widely excludes in their to fix the epoch of their towns that of the Carboniferous so widely excludes in their that very probably the strata surrounding Devonian but Mauch Chunk will be recognized hereafter

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23 Remark a Sigillaria that first of the trees have been protracted either into the coal or at the top possessing now joining that. Their woody substance is generally destroyed. The bark left flattened and heaped in successive layers a rolled crevasse folded as in S. violet. These heaps of bark do not represent. I am persuaded at least many species have formed represented by the bark compare this formation to that of the Dingle Swamps and see Bunny on Sigillaria 1865. who speaks of the often decomposed internal woody cylinder - as of the bark preserved

24 Mark a distinct section of the Sub conglomerate and remark that it is very interesting. — Also a separate subsection should be made of the strata around Pitlochry for reference to their fossils

25 A degree of attention has been given to the geological and also the geographical distribution of the species of the coal. The search of their distribution in the connected with different strata of the coal ground greatly help our acquaintance with the relative [illegible] of the coal strata and thereby simplify the research after their discovery. This can not be done until much more is ascertained both concerning the geology of the geographical distribution. The flora of the coal must proceed by local prolonged research and the data obtained carefully recorded for each strata when the strata is ascertained. In the case Paleontology may be called later to afford some assistance to geology, now it has to receive help from geology

26 As the importance of the date afforded by vegetable palaeontology as the identification of the coal strata, there is indeed nothing to say. In 1850 when I began my researches on the fossil plants of the Carboniferous of Ireland I was persuaded that according to the notions received in European palaeontological circles that it would be possible to find early in the succession of coal strata differences marked enough to ascertain their relative position. I then knew very little of the geographical distribution of the coal plants. At the epoch of the coal or at other times, the vegetation was locally very diversified and as it happens upon the surface of the peat bogs. The diversity was constantly greatly modified by the successive changes in the nature of the plants. Now taking only a single place for one year the surface of a peat bog is covered by grass. They disappear after a while to be replaced by more or small trees, plants or by reeds in fact a way that taking the whole thickness of a peat a given surface of moderate extent has been occupied at different times by a number of plants or groups of vegetables of quite different character supposing the upper layer of the bog to have been covered by ferns and then by muddy deposit permanshales, it is probable that a second bed of peat produced after a long period of time at the same locality may have its surface covered by spruces that these

remains of the plant may be also preserved into mud and shale
both those of the bed underneath. After of course comparing the remains
it is easy to recognize a difference in the vegetation. But transferring
their research to very distant seas from Pennsylvania to Illinois
the ordeal of surface vegetation, the success of the plant in beds of peat
formed at the same period as those of Pennsylvania may be quite reverse
and therefore the points of comparison instead of giving direct light
indirect become fallacious and it is certainly what has happened
or may have happened in the formation of coal strata. The indi-
cations may therefore be of some value when given for a very reduced
area but can not afford advantage for a whole coal basin. In this
case vegetable paleontology may offer general indications which can be
fully trusted. It gave to the first observers the evidence that
the coal strata of the U. S. were of the same age as those of Europe
as they bore a large number of the species described by Brgt. especially
all the genera. It may prove that the lower coal measures
coal strata are not of the same age as those of a later epoch
But for the details paleontology is subservient to stratigraphy and
has to regulate its conclusions to those of this last science. Indeed
it may follow stratigraphy for instructions. It may determine
conclusions on the distribution of the plants from geological data and
will only if possible slowly come to get materials enough to
confirm the data obtained by stratigraphy but nothing more.
It has take for a long time a dependent a servant before it
may become a master or even up for supposing to mount
under the intelligence of Geology.

As am the more disposed to say this because it has taken
a long time of hard study of errors and confusion before I could
put aside ~~that false idea~~ ~~theoretical ideas~~ ~~what was not~~
~~the best point of view~~ what belongs more of the theoretical
assertion are more tenaciously entertained etc. even because
courage and hard work are necessary for their creation.

The above may be put at the beginning of the chapter on the
distribution of the fossil plants in the N. A. Coal measures after
the table; then considering the characters indicated by the table

27. The descriptions are of necessity somewhat longer to obviate in some cases
the absence of figures. And as from the beginning of my researches on the Coal
Plants I have constantly noted every variety or every peculiarity remarked
upon the different countries specimens I have been at some
trouble to condensate all the observations to selected those which might
be more valuable for descriptions for acquaintance with the plants
in more valuable for descriptions for acquaintance with the plants

See Plan.

Examination of the flora afte the Tabl.

1st The plants a the flore in itself. - What it indicates of the existence of the vegetable of the coal. 1. of the physical circumstances of the atmosphere of their habitat. 2. their general characte as vegetable. to what class they represent. their nature as prepared for the building up of combustible materials, lignite. No chemical analysis can be made of the plant. They must be known only by the compounds of their heaped remains. - No food for animal life. great absorbtion of carbonic acid and humidity. - Richness seen by the number of species constantly increased by discoveries. (mode of researches, methods pursued etc.) Mode of preservation and formation of the coal. - Name classes, families described or admitted their general characters. Remarks on the imperfection of the fragments that scarcely any species is known in all its character. stem leaves and fructification. for the ferns when related to their stem or primary rachis is scarcely engraved.

2d Flore compared to that of Europe. Many species described as new or different may be identical or mere varieties of the European ones. This can be ascertained only by comparison of specimens.

3. Geographical distribution.

4 Geological distribution.

Number species which are in America of different formation, silurian, devonian, Carboniferous etc.
Those equally in distribution the Pterozoics of the Sandstone Conneat.
Type not yet found in Europe Megalopteris.

519

28 Remark That some types are known in America or represented by related species are often found together predominant in the same localities as Rhus Rhytion at Clinton Me. The Dordata of Connecticut Pennsylvania Ohio Wisconsin & Canada Pine of Potsdam. This might appear to indicate that all these form described as species are mere varieties of a same species. This however is exactly the same now with living plant. In our forest there are many species which are grouped together quite what is seen in the swamp deserts Europe.

29 Count number of species described and number of stem figured see why there was necessity of descriptions not only to supply the absence of figure but to give a idea of the different form observed by long examination of specimens some which can not be all represented in figure.

30 If I had been the proprietor of the place which belongs to the town of Buena Vista I have described it to the two Botanist friend who have been the promoter of this work and have given me constant assistance and encouragement the Hamilton Agassiz and the director of the museum of Cambridge. Without their appreciation and constant encouragement I should never have been found to publish

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ERRATA.

Page 22, 15th line from bottom, for "old" read older.
Page 90, 15th line from bottom, for "positions" read portions.
Page 97, 16th line from top, for "southeast" read southwest.
Page 109, 15th line from bottom, for "Cophalanthus" read Cephalanthus.
Page 110, 10th line from top, for "eriocephala" read criocephala.
Page 120, 11th line from bottom, for "gasterapod" read gasteropod.
Page 136, 8th line from top, for "three" read these
Page 168, 12th line from bottom, for "Roissi" read Royssii.
Page 184, 16th line from top, for "exactneas" read exactness.
Page 195, 8th line from top, for "Crustaceon" read Crustacean.
Page 195, 18th line from bottom, for "Morgan" read Mazon.
Page 201, 16th line from top, for "fossil" read fossils.
Page 222, 18th line from top, for "oxide" read oxyd.
Page 233, 3d line from top, for "ara" read are.
Page 251, 20th line from top. for "is quite it" read it is quite.
Page 319, 19th line from top, for "Geineitzii" read Geinitzii.
Page 336, 10th line from bottom, for "Tamarach" read Tamarack.
Page 350, 10th line from top, for "enamelled" read enameled.
Page 353, 11th line from bottom, for "bituminization" read bituminization.
Page 356, 5th line from top, for "bevelled" read beveled.
Page 359, 1st line, for "are" read one.
Page 360, 15th line from top, and 361, 4th line from bottom, for "bevelled" read beveled.
Page 361, bottom line, for "enamelled" read enameled.
Page 386, 12th line from bottom, for "diversions" read divisions.
Page 389, 6th line from bottom, and bottom line, for "Brongnarti" read Brongniarti.
Page 399, 7th line from bottom, for "coreaceous" read coriaceous.
Page 403, 6th line from bottom, for "Versteinerimgen" read Versteinerungen.
Page 409, 2d line from bottom, for "Sphenotopteris" read Sphenopteris.
Page 433, 5th line from top, for "Syrigodendron" read Syringodendron.
Page 456, 2d line from bottom, for "Phizomopteris Rrdmani" read Rhizomopteris Erdmanni.

Terminologie

Foliolis a se invicem remotis: (Schp. 1:346, Leaflets at a distance from each other.

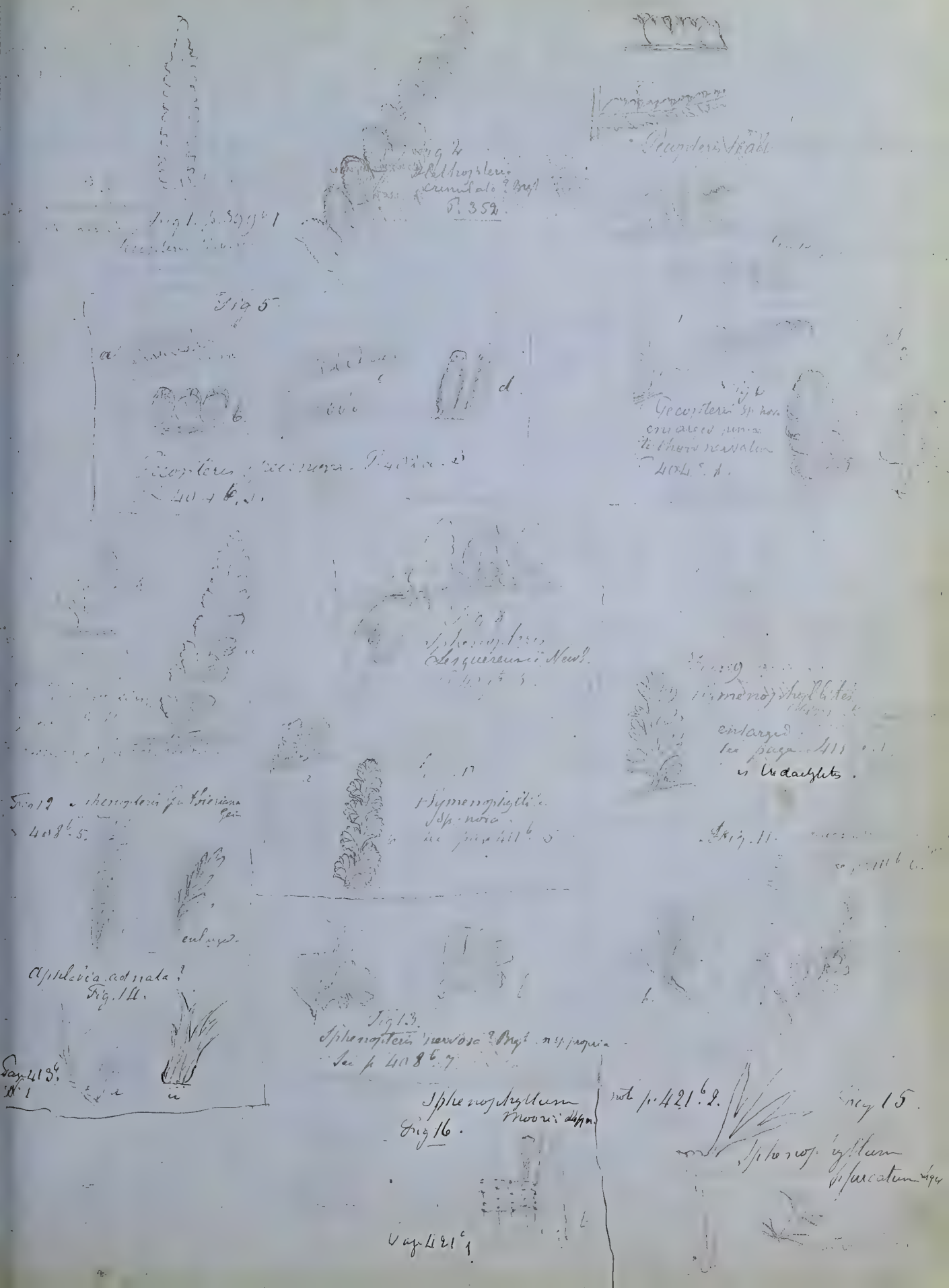
Dichotome: forking twice see Schimper, 1: 367 Kuntze, very rare or merely forking, the rays: bis ter ve dichotomis in Odontopteris alpina or iter iterum dichotomis &c. repetito dichotomis.

Pinnulæ insulæ in rachi primaria pinnis interpositæ: leaflets attached to the rachis between the pinnæ.

Species Americaines mentionnees par Schimper.

Sphenopteris	pauperula Lsq.	P. 380.	
S. "	mixta Schp.	382	= S. mixta Ms. Gein. Schp. 2. p. 435 L.
S. "	latifolia Brgt.	399	
S. "	decussans Lsq.	401.	
S. "	flexicaulis Lsq.	409	
Cyclopteris	lacerata Heer	421.	
Neuropteris	cordata Brgt.	431	(Espe Arctic species of Bunbury
N. "	gigantea Sternb.	436	
N. "	Loschii Brgt.	437	
N. "	tenuifolia Schloth.	438	
N. "	rarinervis Bunb.	440	
N. "	microphylla Brgt.	441	
N. "	Grangeri "	441	
N. "	Cistii "	441	
N. "	auriculata "	444	
N. "	Rogersi Lsq.	445	
N. "	hirsuta Lsq.	445	
N. "	Clarkson "	446	
N. "	gibbosa "	446	
N. "	undans & tenuifervis Lsq.	446	merely mentioned as synonim of N. gibbosa
N. "	dentata Lsq.	447	
N. "	Desorii "	447	
Odontopteris	Intermedia Lsq.	455	mentionné comme syn. de O. Brardii
O. "	alata Lsq.	456	
O. "	subcuneata Bun.	461	
O. "	squamosa Lsq.	463	
O. "	delicatula Lsq. Schp.	463	
O. "	Worthenii Lsq.	463	
O. "	heterophylla Lsq.	464	
Dasycopteris	Moorii Lsq. Schp.	465	
Palaeopteris	hybernica Forbes	475	= Neuropteris obtusa Lsq.
P. "	Roemeri	476	= N. minor Lsq.
Sphenopteris	tenera Hall.	477	

Sketches of plant described in notes of Insect.



Equisetites
not p. 425 b 3.
fig. 2.

Fig 4
Lepidodendron marginatum
not p. 428 b 2.

Fig 5
Lepidodendron sp.
See not p. 428 c 13

Fig 1.
not 425 b 1

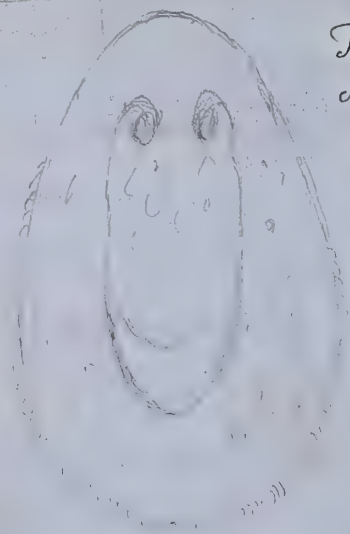


Fig 3
Stenomyelon ciliatum
sp. propria ? not
p. 458 b 7.

Fig 6
Lepidodendron carinatum
not p. 428 c 17

Fig 7
Lepidodendron
Sprucei
Not p. 428 d 21

Equisetites occidentalis
Font.

Fig 8
Lepidodendron
sp. propria
Not p. 428 d, 23

Fig 9.
Lepidophyllum ?
See not 19
p. 441 d.

Fig 10
Lepidophloios sp. nova
not p. 439 c 4.

Fig 11.
Sigillaria
mamillaris
Not p. 446 b 3.

Fig 12.
Sigillaria
reniformis ? Rog
not 446 c 11.

Fig 13.
Trigonocarpus
sicyonis Lyc.
not p. 460 b 1.

Fig 14
Trigonocarpus
Parkeri Lyc.
C. 460 b 3.

Fig 15
Trigonocarpus obovatus
Not p. 460 b 4.

Fig 16.
Trigonocarpus subglobularis
sp. prop ?
not p. 460 b 5

Fig 17.
Trigonocarpus
Huntzdianum ? Gein.
Not p. 460 b 6.

Fig 19.

Fig 18.
Trigonocarpus Dawsoni ? Lyell
Note p. 460 b 7

Trigonocarpus Speciosus ?
not p. 460 c 8.

Fig 1.

Fregonocarpus
Communis ? Sp. sp.?
See not p. 460 c. 9.

Fig 2.

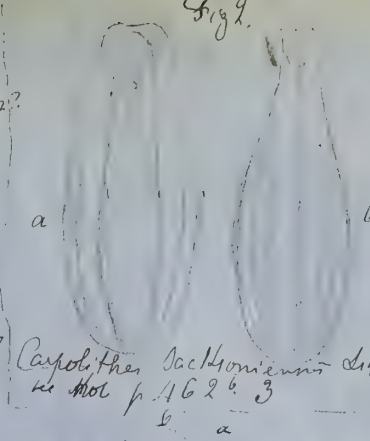


Fig 3.
Carpolithes
Howardianus
Sp. sp.
note p. 462 b 4.

Fig 4 spec: ca 57

Carpolithes Dactylonicensis Sap.
See not p. 462 b 3

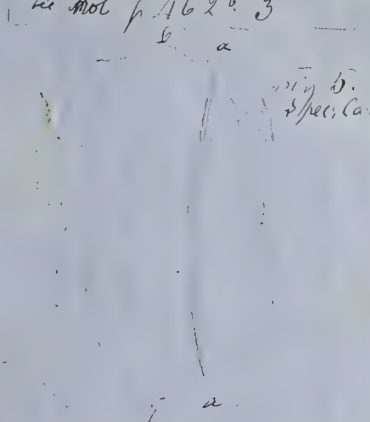
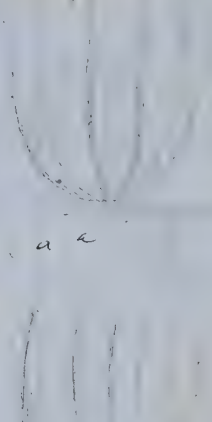


Fig 5.
Spec: Ca 65.



Carpolithes
Species prejecta?
See not p. 462 b 5
Voir fig. 4. 5, 6. 7.

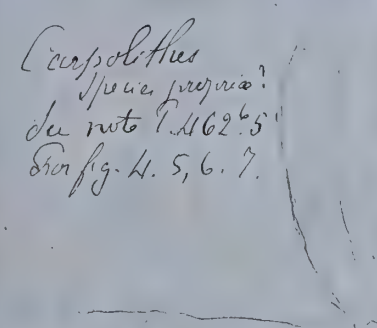


Fig 7
Spec: Ca 40 b.

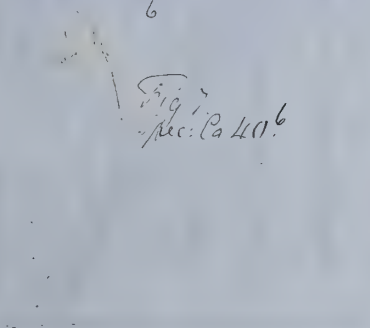


Fig 6
Spec Ca 91.

Fig 8.
Carpolithes
Lindenbergi.
not 462 b 6.

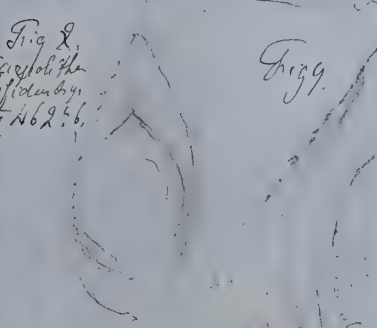


Fig 9.

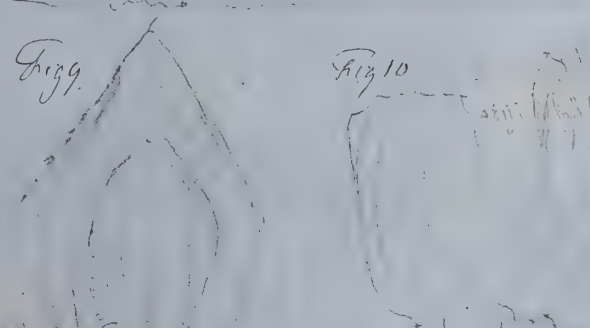


Fig 10

Fig 11.

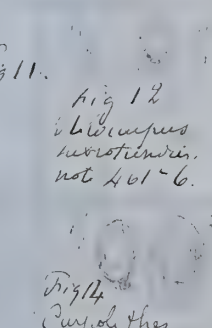


Fig 12
Dilocarpus
neostrianus.
not 461 c 6.

Fig 13
Dilocarpus
Cornutus Sap
Fl. Sp. vol 4 p 49.
Ann. 461 c 7.

Fig 14
Carpolithes
Equisetiformis
note p 462 c 10.

Fig 15
carpolithes retusus
not p 462 c 11.

Fig. 16
Carpolithes
fasciculatus Sap.
not p 462 c 13

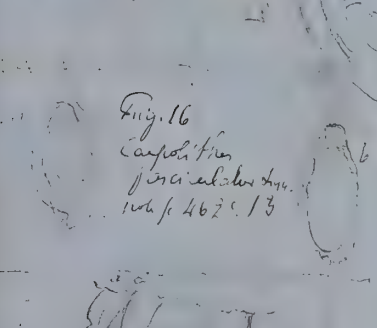
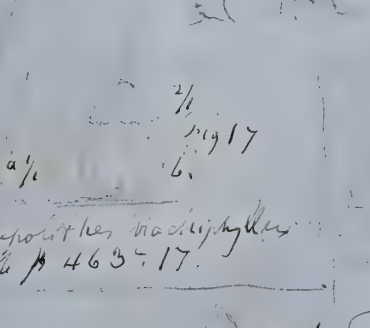
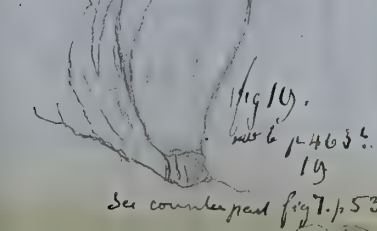


Fig 17



Carpolithes Radiisphyllus
note p 463 c 17.

Fig 19.
note b p 463 c.
19



See counterpart fig 7. p 531.

fig 20.
Fig 20.
note p 463 c 20.

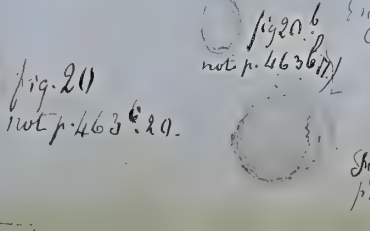
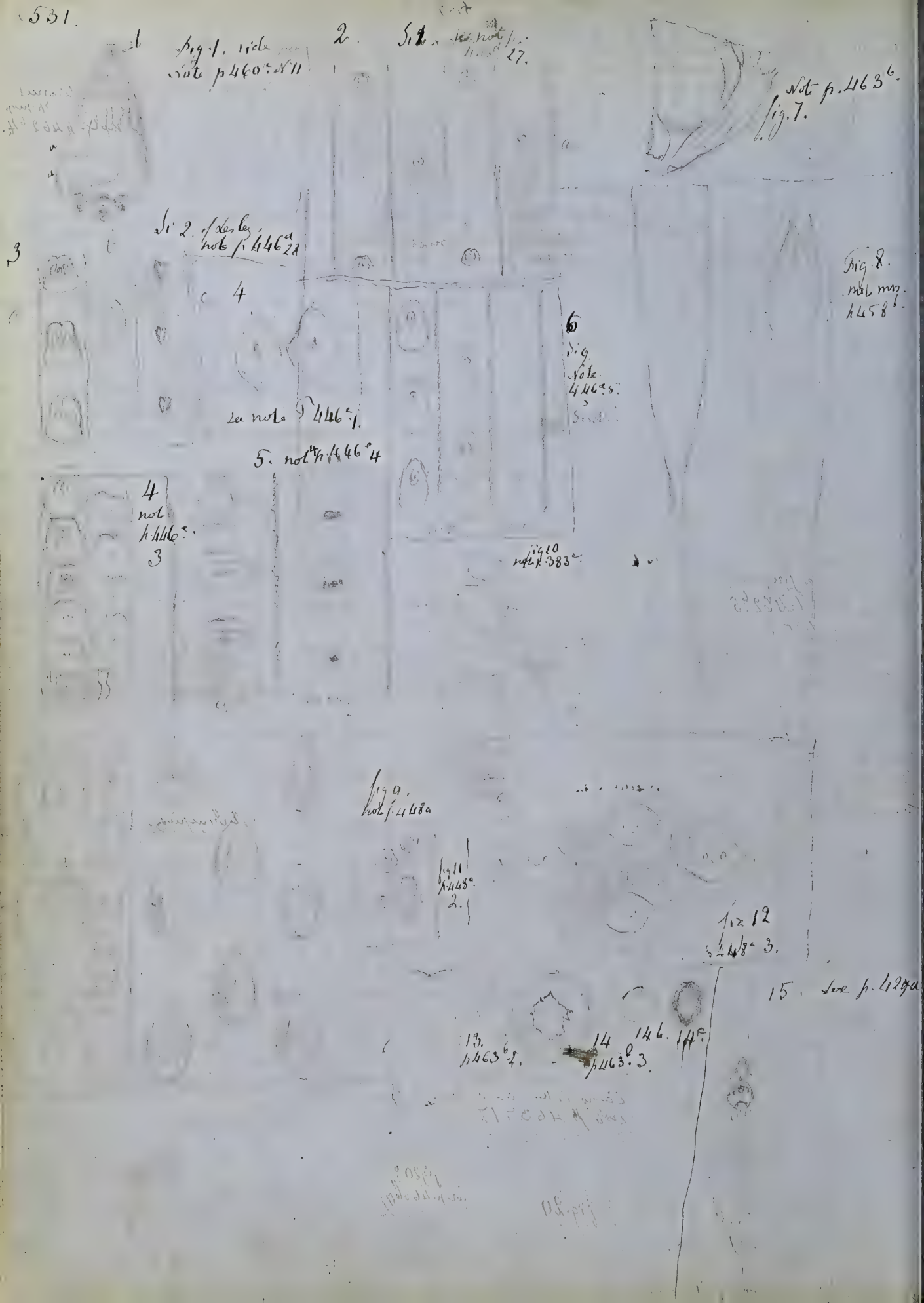


Fig 18.

Carpolithes
imbricatus Sap.
H 463 c. 18.

Fig. 21.
p 463 c. 21.


1
fig 1. viola
note p 460 a N 11
2.
Si 2. note p. 27.
Not p. 463 b.
fig. 7.
Si 2. viola
not p. 446 a 22
3
4
fig. 8.
not mus.
h 458 b.
6
fig.
Note
446 a s.
la note 9 446 c 1.
5. not h 446 c 4
4
not
h 446 c.
3
fig 10
not 383 c
fig 9.
not p 448 a
fig 11
h 448 c
2.
1 a 12
h 448 c 3.
15. see p. 429 a
13.
h 463 b f.
14
p 463 g 3.
146. 14 f.

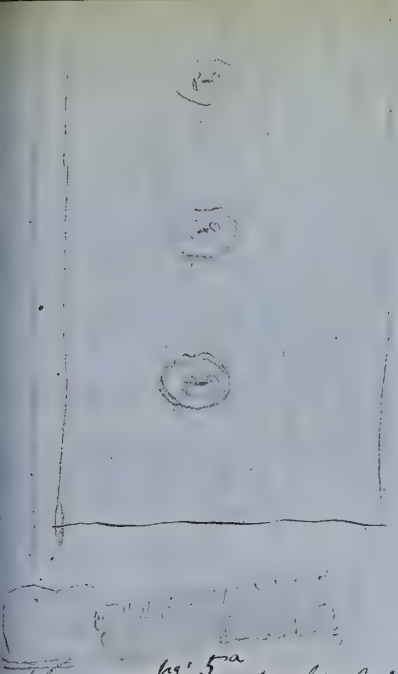
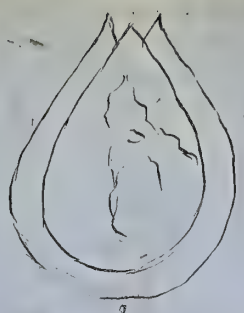
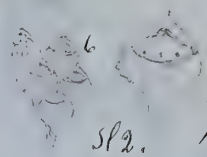


Fig. 1
not 1448 b.
N. 4.



3

Sl 2 l.



6 6 enlarged
Description
p. 439 c. 3.

Sl 2.

4

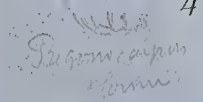
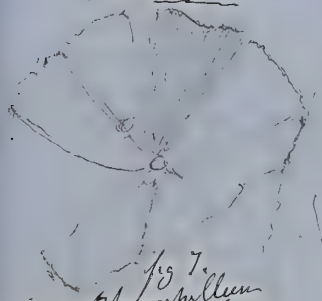


Fig. 9.
Lam. 429
p. 486 l.

5 b.

Fig. 5 a
Althorbeis longifolia Host
p. 469 b. 1.



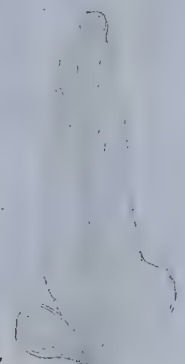
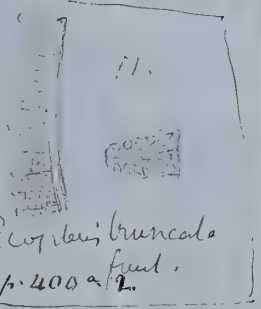


Fig. 6
p. 470 b. Odontites
Wortheni.



11.

Fig. 7.
Rhinanthus
Schlotheimii var. latior
p. 421 c. 3.

Scorbeis truncata
p. 400 a fruct.

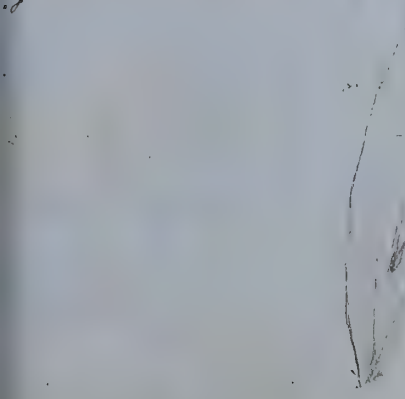
10.

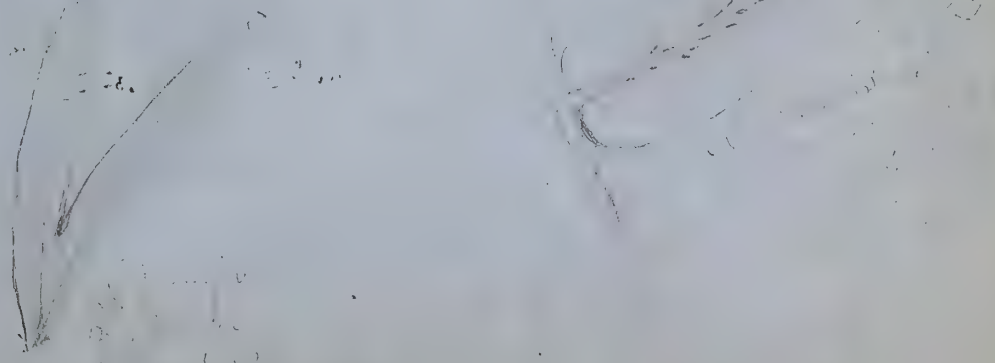
Rhinanthus
Crista galli

10.

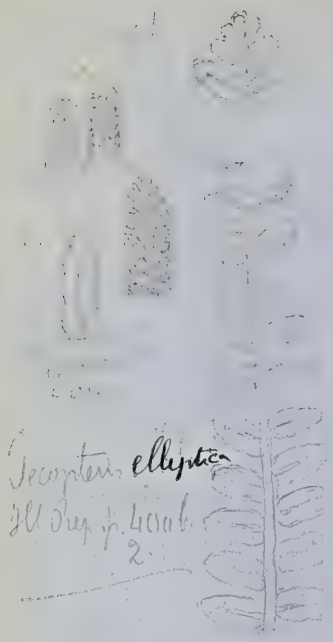
12

Neuwiesia Chaixii
in Chaix Pannonica.





533.



Decapteron ellipticum
Ill Dep p. 4 c. 1. b.
2.

Hymenopleurus expansus?
Guér. Ill Rep Dep p. 413 c. 3

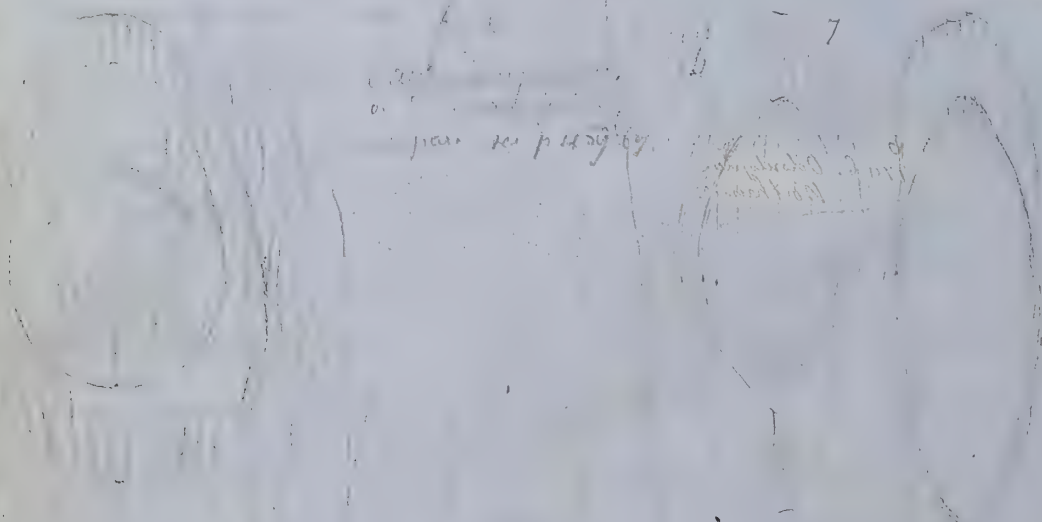


fig 10
p. 4 c. 16

Cordaites gracilis Ly (corrected from p. 361 (4)). The veins, primary and secondary are not quite distinct in the upper part or rather upper surface of the leaves either covered with their thick epiderms or under it. On the lower surface and toward the upper end of the leaves the primary veins are distinct or a little stronger than the secondary ones, distant about one millimeter distant separated by 3 to 6 smaller secondary veins toward the base of the leaves, the nerves become all equal, the primary no scarcely different and there measure 5 to 6 per millimeter. This is the same distance of the veins generally speaking as in the upper end of the leaves where there are 5 or 6 intermediat veinlets between the primary one millimeter distant. The upper surface has the same nervation but far less distinct. On both surface the epiderm is thick minutely granulated across as in all the other species. The difference of this species with C. angustifolius is clearly marked in the narrower leaves, half as broad, the rugose punctulate surface of the stem when excoriated, the far less distinct nervation of the upper surface of the leaves, &c. Correct plate index a which should be oblong and curved inside. - The borders are also slightly reflexed backward

2. Cordaites (Carpolithes) (another name) sp. nov. from p. 479 c. 5). This species seems to belong to a different section. It is represented by three specimens. Ma 329, with leaves Ma 123 bis-141 stems only. All these stems are small branches 1 to 1½ cent. diameter. The leaves are not very distant nor crowded, linear, slightly enlarging upward narrowed and rounded at the point of attachement on inflated mamilla, remaining decurring and narrowing downward, rarely at the top as seen on 123 (figure one). preserved upon the stem bearing after erosion or abrasion linear, short parallel interrupted narrow ridges not giving to the surface of the stems an appearance of coarsely striate. By the form and the position of the leaves, it resembles C. Mansfeldi, the nerves being very distinct, especially when the epiderms is destroyed. Primary nerves 3 to 4 in two millim. with three or four more rarely, five thin intermidiat veinlets; surface distinctly crowwrinkled. None of the leaves is preserved entire, the longest one broken at the top is 9 cent long. See description p. 479 c. 5. Ma 329 a is a small specimen a branch with leaves attached to it showing distinctly mode of attachement. (Figure it with 123). (Cordaites elliptica of Grand Eury pl XXVII f. 5 for some reserves to this but it is far different.

4 Cordaites (Carpolithes) sp. nov. (changes name)?) Ma 307. Stem or branch small two centimeters broad, (flattened). Leaves very long linear, flat, one cent. meter broad, 3½ cent. long as far as seen to the point where they are broken and where the are of the same width, crowded and imbricated, decurrent at the and abruptly folded back in right angle to the stem above their point of attachement which is not distinctly seen and appears like a somewhat narrowed decurrent base. The stem being evidently covered by imbricated decurrent pair of leaves. The surface of the leaves is opaque, without any distinct veins or nerves with a strong glass only it is seen traversed by very thin all equal lines 25-30 in the millimeter and across by very thin lines quite as distinct in one way as to the other send therefore forming a netted surface. The leaves are not so different than those of the specimen in clay, 40 cent. minutely as to that of very thin tissue by thirty one with the branch or one side and the whole surface covered by the leaves all flattened in the same direction, parallel to each other and in right angle to the branch or fragment of stem. See description p. 479 a. (2).

5. Cordaites (Carpolithes) decurrens sp. nov. (see description 478 c. (2), 479 a. 1.) from specimen Ma 139, 305, 141 (313?) This one is formed of stem. The large specimen 305 is labeled It shows the large stem part of which is decorticated, the cortical part showing the mode of decurring of the leaves and the decorticated the point of attachement. This should be figured, at least at least.

535 to show mode of attachement of the leaves their scars etc. The corner of the plate where 161 is figured could be used for this. This species especially differs from P. deflexus by narrower somewhat thicker leaves with a thinner surface and the very long decurrent narrowed part of the leaves. The areolation or epidermis of the leaves is of the same nature.

6. Cordaites, Centrites (or another name) specimen Mc 162. see figure 2-7e 2. Described p 479 b 3 – The leaves are about half the size of those of the former species, linear and equall in all their length. I can not see any trace of veins upon any part of the surface which is covered more generally with a thick epoderm transformed into coal with a rather granulous surface. This character separates them from the leaves of Grand Eury named Dicranophyllum which the surface is opaque and without traces of striæ or veins. Specimen

6a Artisia: Mc 311 has bundle of the same kind of leaves. It represent a branch with scars very regular wrinkles or narrow flat ribs like those of Artisia when flattened with a bark of thin coal without traces of scars of leaves. This bundle is 19 cent. long, 4 cent broad, paralleled is crumpled in the middle by an articulation and a large scar of a branch like that of Calamites Cannoni but without internal striated scars and from this branch and from under it is derived from the border of the stem comes out a bundle of leaves like the one figured and of the same character. The point of connexion of these bundles of leaves to the stem is not positively seen as there is another separat bundle upon the same specimen, so on seemingly attached to the border of the stem may be casually placed there and therefore the connection merely apparent. The articulation of the branch and its nodes are however positively marked and like an anomaly in a branch referable to a Cordaites? – Another specimen 2344 has a branch of the same appearance and size marked across by the same transversal narrow flat ribs with a thin bark of coal and distinct and distant scars of leaves visible only upon the bark not at all marked under it. Mc 303 is a specimen representing a bundle of leaves of the same species some of which appear attached and decurring upon a very thin flexuous branch. But this two may be a mere appearance as the bundle of leaves is continuous below the branch and appear there without connection to it.

7. Dicranophyllum? The above leaves have no reference as seen above to Dicranophyllum: I have however specimen Mc 162.– which represents three narrow linear nerved or striated leaves no more than two millimeters broad and at least 10 cent long which seems enlarged at the base and there joined to or coming out of a small oval mutilated or carpolithes, like C. dilatatus of Grand'Eury pl XXIV fig 7. They curve in bow form and divide in filaments at the top just like the leaves of Dicranophyllum striatum, Grand'Eury.

8 Cordaites fasciculatus? Cordaites Spec? see description of Mc 258 or 250 p 479 a 3 By the size and the texture of the leaves this species is like Cordaites decurrens in like C. deflexus but leaves half a leaf. The point of attachement of the separate leaves is not perfectly distinct also. However visible for the base of the point a and also distinctly see for the consecutive fasciculate bases of leaves above. The stem is flat and marked by irregular narrow ribs but appear thin and of the same texture as the leaves being smooth and shining like them

9 Cordaites anomalus. see figures and description C. Mss. p. 19 N. 79 & p. 30 N. 796. Compare specimen which have and complet the description upon the texture of the leaves. – I have compared the specimen figured 231. N. 26

~~10 Cordaites (Noeggerathia) grandifolia see Chapter 47 Bd I p 22~~

which is evidently the top of the same specimen pl 27. It shows the gradually pointed top of the stem which is still 6 cent broad below the point where it is 2 cent 1 cent long. The leaves figured exactly as on one side, the other side being broken. Their angle to the stem gradually enlarges in descending the stem is covered by the parts marking base of scale which are still persistant and distinctly seen on the borders. On the surface of the leaves, both cortical and decorticated is a mottled bed seen with the glass it shows eight or nine primary veins in two millimeters separated generally by two intermediate very thin secondary veins and not exceeding 1/2 cent long which can be seen with a strong glass. It appears therefore to have the characters of a Cordaites

10 Cordaites (Noeggerathia) grandifolia see description p 478 a 1, 2 and figure compare Noeggerathia Beschreibung Gatt. V. VI p 108 pl XII fig 3.

11 Cordiantheæ species — C. gemmifera as I have exactly figured it is represented in two small specimens of Britts and in a very large one all N 64 always a single branch to the large specimens some of the scales are evidently cast at the point as I marked it it pencil upon the figure of the plate in the other specimens the scales are more or less obtuse or acute scarcely if ever mucronate with a top cortex hence this is no character worth remarking the upper surface of the scales is regulose in the length as seen in 64 a while in other specimens it is smooth and polished. The buds are either with or without bracteæ at the base, for they appear to be early fallen and are preserved only at the very branches or young buds. The specimen fig 3 pl XXVIII dd may be a young state of the same species; the scales are short few, very obtuse and ribbed or sulcate lengthwise with a distinct median rib the buds without bracteæ as with very long leaves one, eleven to 12 millimeters long. Specimens 21 pl & 21. 98 in collection from Mazo Creek appear to be Cordiantheæ bacciferæ But they are obsolete by permineous mineralization and some of the buds evident by stem scales what appear as half destroyed by decomposition or maceration Hence I do not describe any Cordaites bacciferæ from bacciæ attached to stem

12 Cordiantheæ? species Mc 280 This is not yet figured but should be. It represents two nutlets ovate or rounded, the both deeply emarginate or indented at the point of attachement to a narrow stem and nearly opposite, one and an half centimeter in diameter with the surface nearly smooth or slightly obscurely ribbed lengthwise covered with a coating of coal here and there detached and with a narrow border formed or covered by a coaly matter. These parts have some relation to fig 24 pl XXII of Lyon and Lesquereux the basilar indentation and to the form to fig 26 of the same plate

13 Remarks on Cordaites. I have never seen any leaf or fragment of leaf of several species figured by Geinitz pl XXI fig 1. c of the Steinkohlen formation in Sachsen but I have seen and described in the book p 359 as C. angustifolia narrow nearly cylindrical leaves from the anthracite of Penn. May be they should be considered as a new species as rather referable to Cordaites dubius nervis 9 pl. 4 pl 11 fig 1 considered as a new species as rather referable to Cordaites dubius nervis 9 pl. 4 pl 11 fig 1

14 Dicranophyllum? species? Mc 321 This specimen is a remarkable one and should be figured. It is partly described p 498 a 1. The stem which is flattened but which seems to have been originally cylindrical is twelve centimeters long, 15 millimeters broad in its lower half or

as far high up as the first articulation with a branch and only one centimeter broad above there to the second articulation with two branches or more. From the next articulation on the middle, a branch diverge on an angle of about 50°. It is 6 to 7 millim. thick, a little more than 5 centimeter long where it is strangled a abruptly narrowed as for an articulation topped and continued upward in the same direction either by a prolongation of the stem only a bit of the same width, a part only two and an half centimeter long whose surface though obsolete seems exactly different from that of the lower part has not any coaly epidermis or ball and is obscurely striated in the length by three or four flat narrow costa or ribs. The top of the main branch which is 6 or 7 cent. long is also articulat and from the articulation two branches or leaves just like the one on the top of the lateral branches pass upwards, diverging from their point of attachement which is contiguous or both are on the articulation. These two divisions appear rather divisions of branches rather than leaves for they are covered by a thin coaly epidermis like the main stem under which they are obscurely lined as is also the main stem. It therefore appears that all the divisions from articulations either from the branches or from the stems are branchlets. This appears the more prudent that from the upper main articulation and from the part of the stem under it narrow deeply nerved or divided leaves quite similar to those of Dicranophyllum come out in right angle of the branch. The stem there or under the articulations and below bears small circular or oval convex scars which appear those of narrow leaves ∞. These leaves are deeply distinctly nerved or striated like those of Cordaites, still more distinctly

and at a short distance from the stem divide in two and then in [illegible] lacinia. Specimen should be figured. I refer it to Dicranophyllum. There is another specimen, Mal 36 which still more positively indicate its relation to Dicranophyllum. It represents a fragment of stem only seven centimeters long 1½ cent broad with the same surface appearance as marked in the specimen 321. surface irregularly and obscurely striat covered with a thin coating of coaly matter bearing nearly in right angle and as in the former specimen very narrow leaves, one ½ to 2 millim. striat or obscurely simply nerved the nerves a trifle dividing near the top in the upper part or in the leaves figured by Grand'Eury as Dicranophyllum. These their leaves are enlarged at the base and the enlarged part is smooth or not nerved. There is no doubt that these fragments are referable to plant of the same nature as the Cordaites, the nerved leaves their form, point of attachment, being the same. The relation of the leaves upon the stem is not indicated by the scars which are merely as small nearly round button like protuberance

15 Cordaites Mansfeldi. The specimen Mal 371. represent a large stem or branch still than that figured. From the base of the branch 2 to 3 cent thick a branch diverge in the same way as in my figure, on an acute angle of divergence. But the branch is thicker more developped already about 22 cent. long with the bases which are all gradually and steeply acuminate with the borders somewhat curelled towards the point. Above there is already about nearly 15 cent long. The nervation very distinctly marked is preserved in the bases of the branches is same as in the specimen figured as in the large leaves, the primary vein varying from ½ to 1 mill. distance with 2 or 3 intermedial veins.

1. Ma 378. Represents a very peculiar cone. It is born at the top of a cylindrical regular stem 6 cent. long 6 millim. broad. passing up through the cone it top at last a stem by a depressed stem bone. The cone is 6 cent long 3 cent. broad at its base gradually tapering to a point or conical. It bears placed in spiral protuberent ◇ scars about two millim. distant from each other as we see from those of the borders, these scars are those of leaves of Cordaites, narrowed at the base like those attached to the stem, 5 mill. broad. The primary veins more or less distant, about 3 in one mill. with three or two intermediate ones, the surface rough transversally distinctly wrinkled. The Remarkable cone are covered by a scaly coating about 1/4th of a millim. thick which does not obliterate the traces of the stem, 7 primary ones with 2 thinner intermediate ones. They are more marked upon the scaly cortex than upon the surface deprived of it.

2. The reverse of Ma. 378 has a fragment of leaf 7 cent long, 8 mill. broad at the base gradually enlarging upwards to 32 millim. where it is broken. The primary veins are obtuse very close 3-4 in one millim. with one intermediate veinlet often invisible. It appears by the nervation and the gradual enlarging of the leaf from a narrow inflated base to be same as C. grandis from described p. 478a.

3. Cordaites serpens. sp. nov. Stem narrow 1½ to 2½ cent broad wavy or serpentine apparently very long, one of my specimen Ma 306 is 50 cent long varying in size from 12 to 24 millim, narrowest in the middle, enlarged at both extremities passing through the whole length of the specimen and covered with close luminescent scars of leaves nearly rhomboidal ◇. All the leaves are destroyed. Upon the specimen figured the leaves are about in right angle to the branches somewhat distant, narrow, 8 & 10 millim broad, flat, base upon semilunar scar somewhat narrowed at the point of attachement, line as (length not seen). distinctly marked with primary veins 4-5 in 3 millim space with 3-5 smaller intermediate veinlets, the primary obtusely keeled the secondary obtuse. The top of the branches ended into a large leaf, as large as the stem, long; the longest measures 28 cent. to the point where it is broken, covered with a thick coating of coal

thicker than that upon the leaves nervation distinct, in relief upon the bark showing on the under part the primary veins of these just described primary veins about a in the stem leaves, a little closer with the same number of intermediate veins also distinct scarcely or not at all wrinkled across as also the stem bark. One specimen show the upper part wholly of a cylindrical stem depressed of its bark and marked across by deep very distinct obtuse equal ribs with the bark? or partly by a terminal leaf nearly two millim. thick bark and gaping up in slightly widening to the terminal leaf. The point of the cylindrical stem is not cut but both like a somewhat obtuse terminus or end as the coating of coal covering the leaf is continuous upon it and marked with nerves. This show therefore that the stem stopped growth abruptly and gave rise to the leaf which terminates it. As seen in the specimen the terminal leaf is enlarging upward sometimes as in No 393 series. it is at its base cut or divided in irregular lacinia diverging from it by the fragments and flexuous. Their nervation is the same as that of the stem but by laceration of the leaf it becomes mixed and irregular more or less inflated per places.

1. Taeniophyllum imbricatum No 161 see description (poor) p. 459 b. 2. Might be the same species as T. decurrens. Though different indeed. This is also part of a large stem. The leaves imbricated at base are not decurrent or do not appear to be. Thereon along the borders are cut square at the base, slightly dimorphous; the scars however are decayed of the same character as in T. decurrens. or rather longer narrower linear not unfolded at the lower end. The veins of the leaves under the coaly surface or epidermis are so thin that they are scarcely discernable with a strong glass. The nervation is the same as in T. decurrens. the leaves however are broader generally covered with the coal coating of coaly epidermis less or scarcely decurring upon the stem which is however covered by their imbricated base but not narrowed and costate as in specimen 305. Any how then can not be separated into different genera.

2 Trunks of Pl LIX. (provisoire) Fig. 5 resembles Pandanocarpum Congnieri G d S. pl XXI Fig. 6 resembles C. Gutbieri G Pfl. Fig 7. is described p. 536 (12) Figs 8–11. are somewhat like C. ventricosum G. Pfl. loc. cit. No pandanoid like new recognized

X

compare C. lanceolatus Gr. Hooker 1212. PL XX, described as lanceolate 540

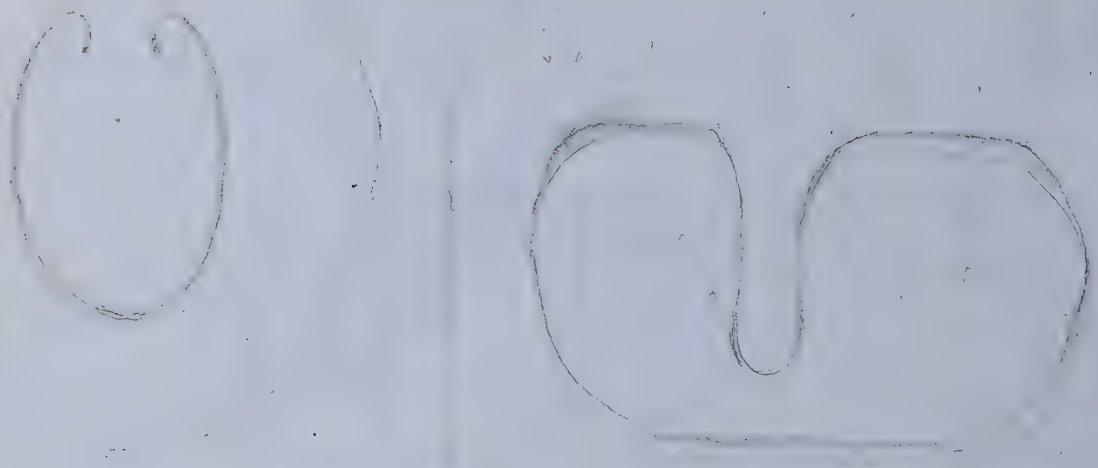
Condaites laceri. Among other leaves sent by Lacroix there is a small one oborate 3 cent long seven millimeters broad at the base, 1½ cent broad near the very obtuse top; primary veins prominent Reseau veinlet scarcely discernable. Compare Gr. Hk. pl XXI f. 3 Ca. foliolatus.

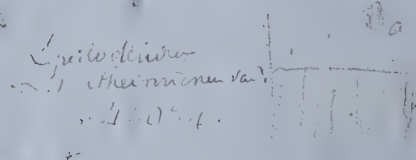
1 Cordaites! grandifolius? flowers. Saw 46a: Racem about 18 cent long curved ⌒ in the middle, axis or stem grooved in the middle, two millim. broad heavily mostly opposit ternate glomerules or gemmuli of a few imbricated scales, which when detached show an oval nutlet. gemmuli ovate or obovate the largest near the base of the raceme joint from milli by three to 3½ millim broad. the nutlet when the involucres are out is about as long. The same specimen has a long narrowed base of Cordaites grandifolia and nutlet like those of Cordianthus baccifer Lpt H. pl. 26, fig. 10. but nearly round 7-8 millim across emarginate at base and surrounded by a ring. like fig 27 same plate Diploteca Grand Eury, Bgt. These flowers therefore are gemmiferous when surrounded by the involucres but truly baccifer when ripe.

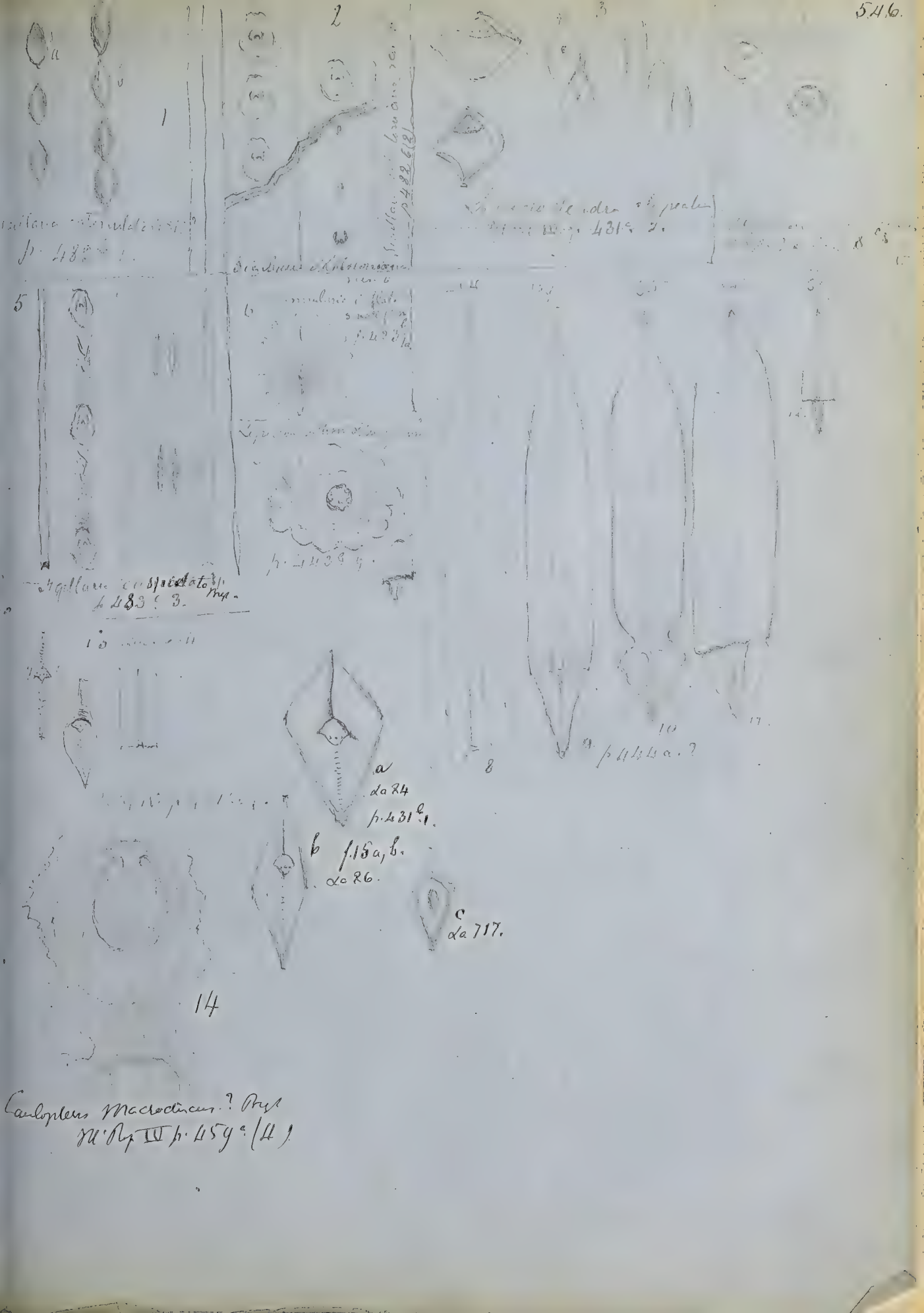
2. Dicranophyllum gallicum Lpt H. Ma p. 506. represent short leaves 3t 4 cent long, half cent broad at the base, forking dichotomy from the main axis and the forks dividing again in true lanceolate division, either 4 nerved and pointed or dull forking at the point. The substance is thick, razor thin as dry, veins marked by two or three coarse or obscure veins. These leaves are like those of Grand Eury Pl XIV f. 10. described under the above name p. 275

3 Cordaites radiatus Sp. nov. Ma. 528 Leaves flattened flabelike around a central axis 22 leaves linear narrowed to an obtuse point 5 to 8 centimeters long 5 to 7 mill. broad. thickly nerved, nerves separated by one or two very rarely three veinlets, surface somewhat wrinkled by indistinct crosswrinkles about 5 to 6 plain or regular

4 Cordaicarpus attached to a branch of Cordaites costatus. Ma. 531: 4b. The branch is flexuous ten centimeters long, a little more than one centimeters broad, marked by three prominent thick wedge shaped bolster support of bandy leaves as seen in Pl LXXX f. 2 but more inflated say 6 to 7 millim broad at the round inflated top narrowed into a flexuous filamentous pedicel. The scars appear in spiral four to five for a spiral. The fruit is oval three centimeters long from the point of attachment, nearly three millimeters broad flattened with a border of three millimeter broad marking perhaps areolae. The point of connection of the fruit to the stem is distinctly seen upon the back impression of the stem a counterpart of the specimen. where the half the stem of the fruit is left attached while the other half is on the real stem. Difficult to represent without figure







Carlopteris Macrodiscus? Ryc
M. Ryc III p. 459 a (4)

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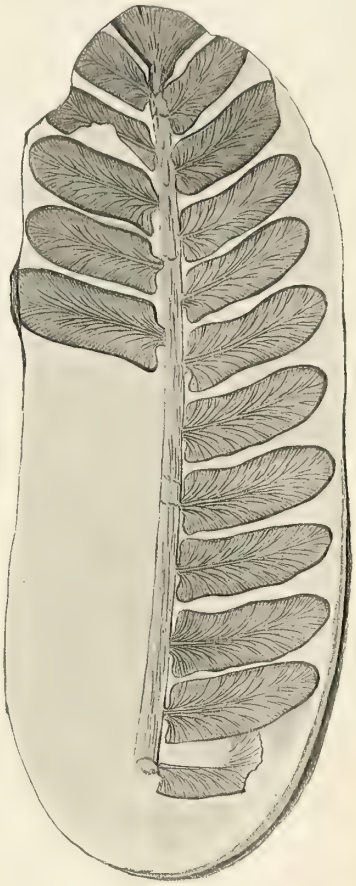

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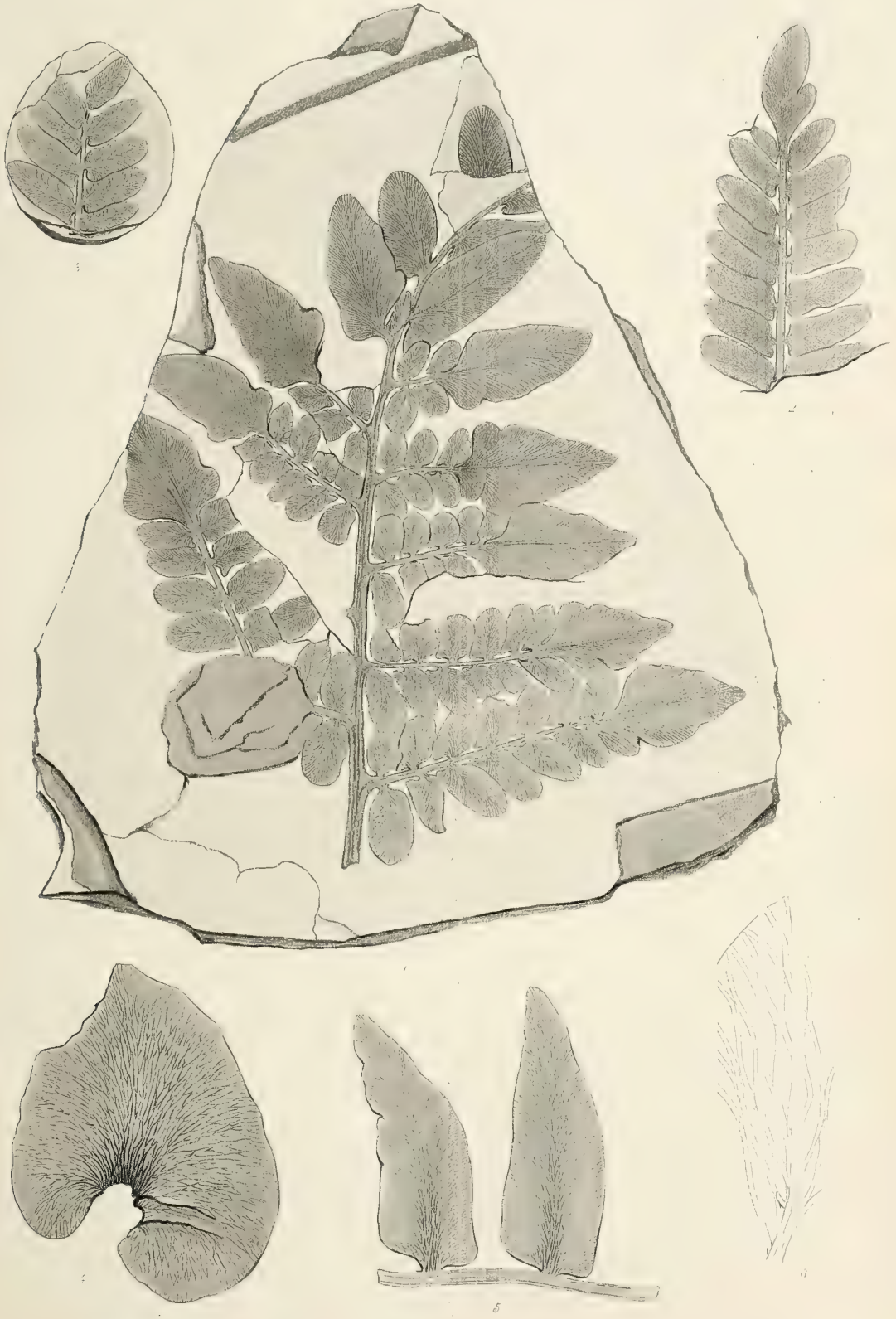

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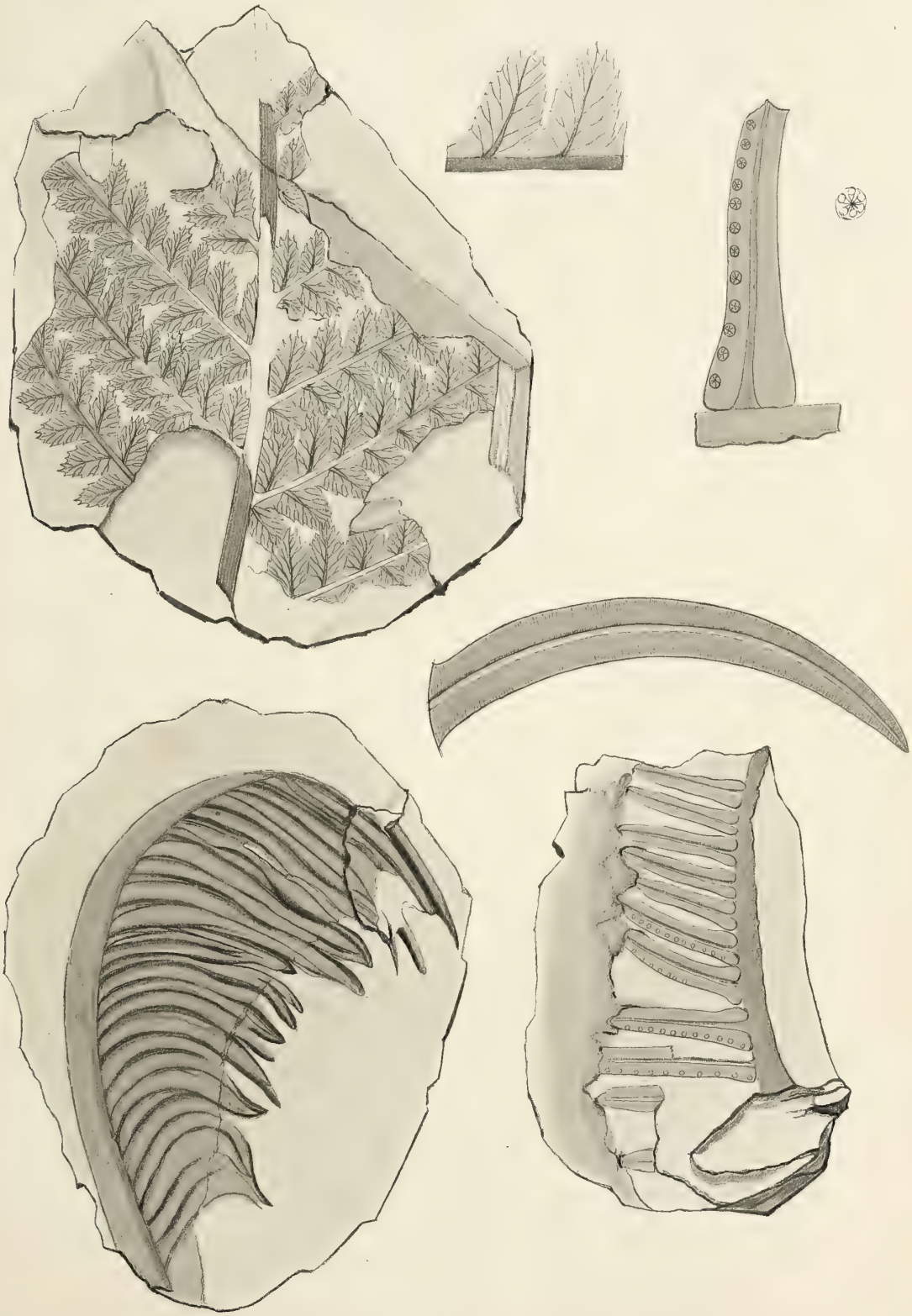

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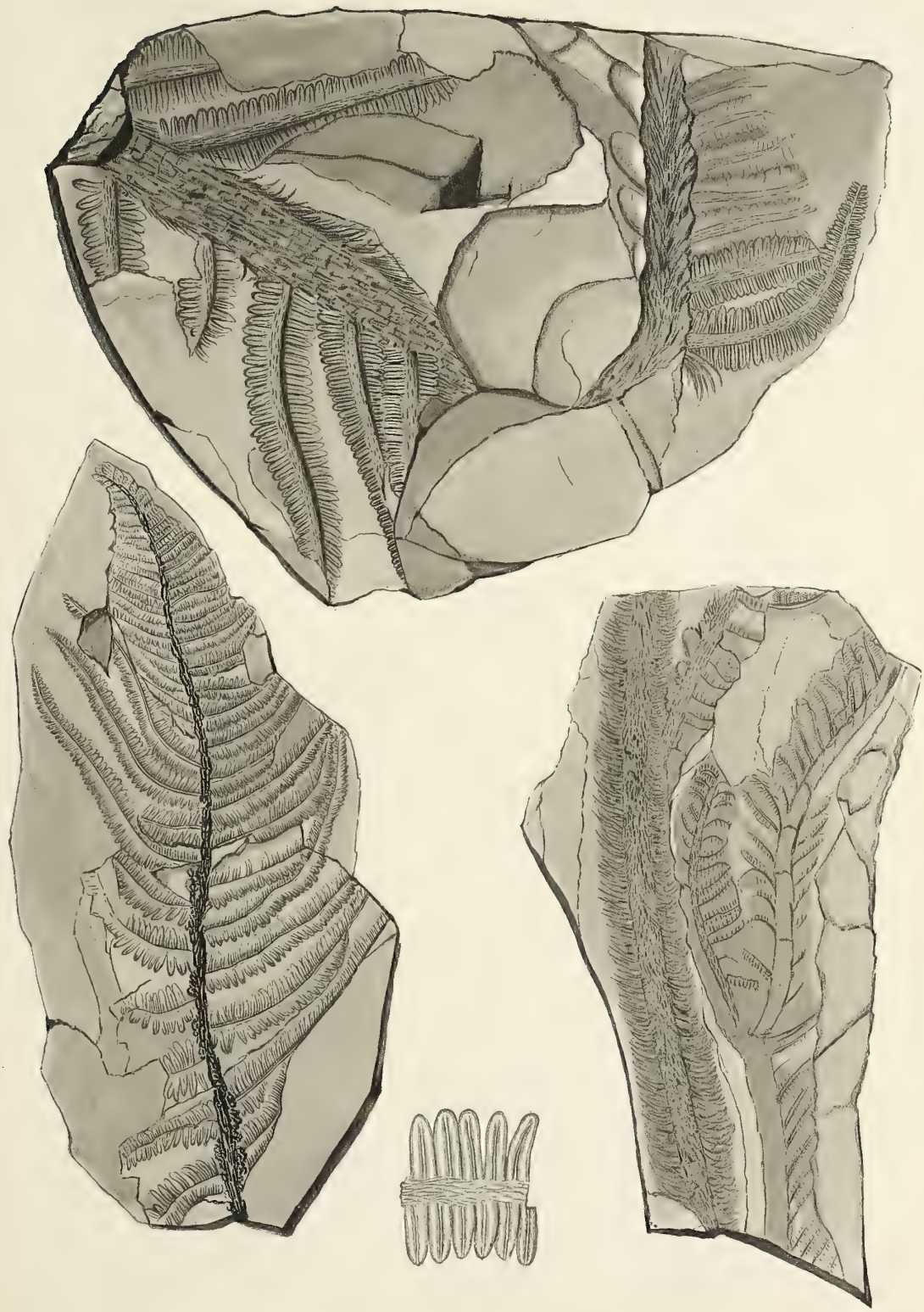

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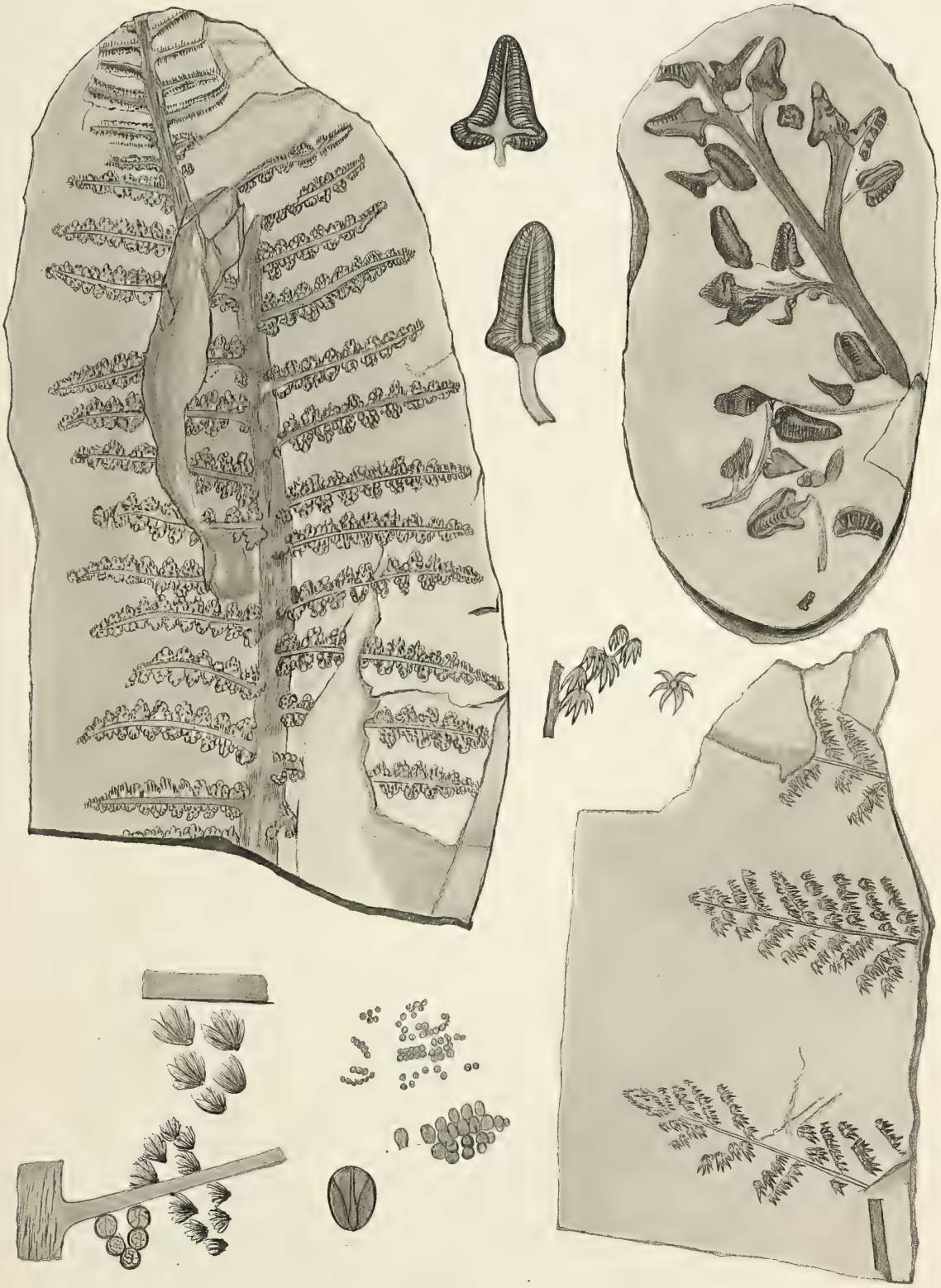

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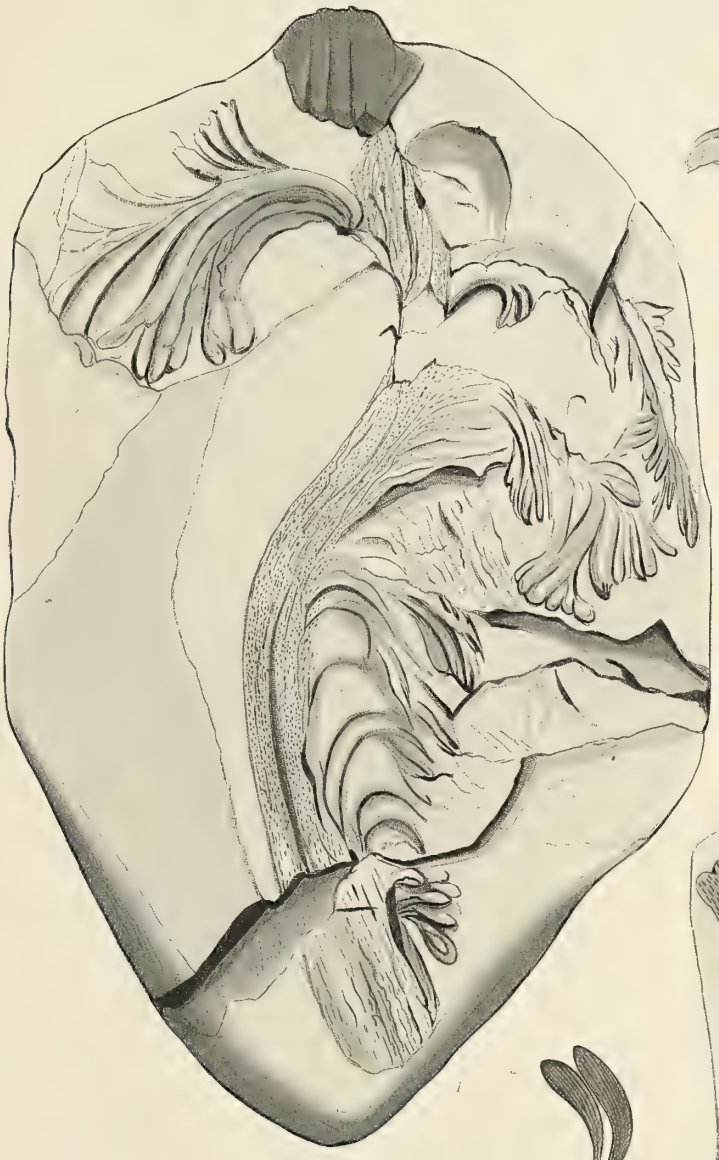

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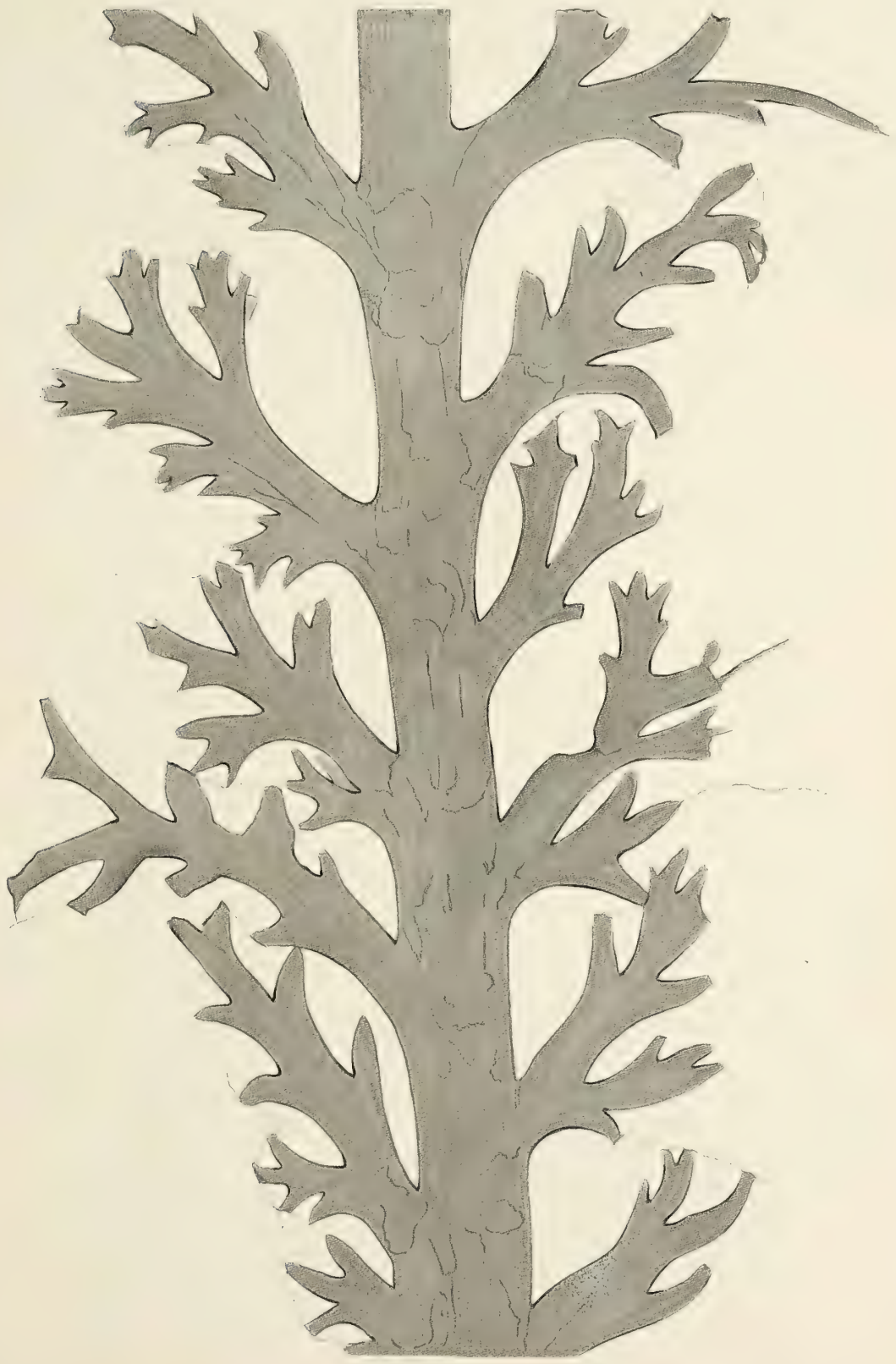

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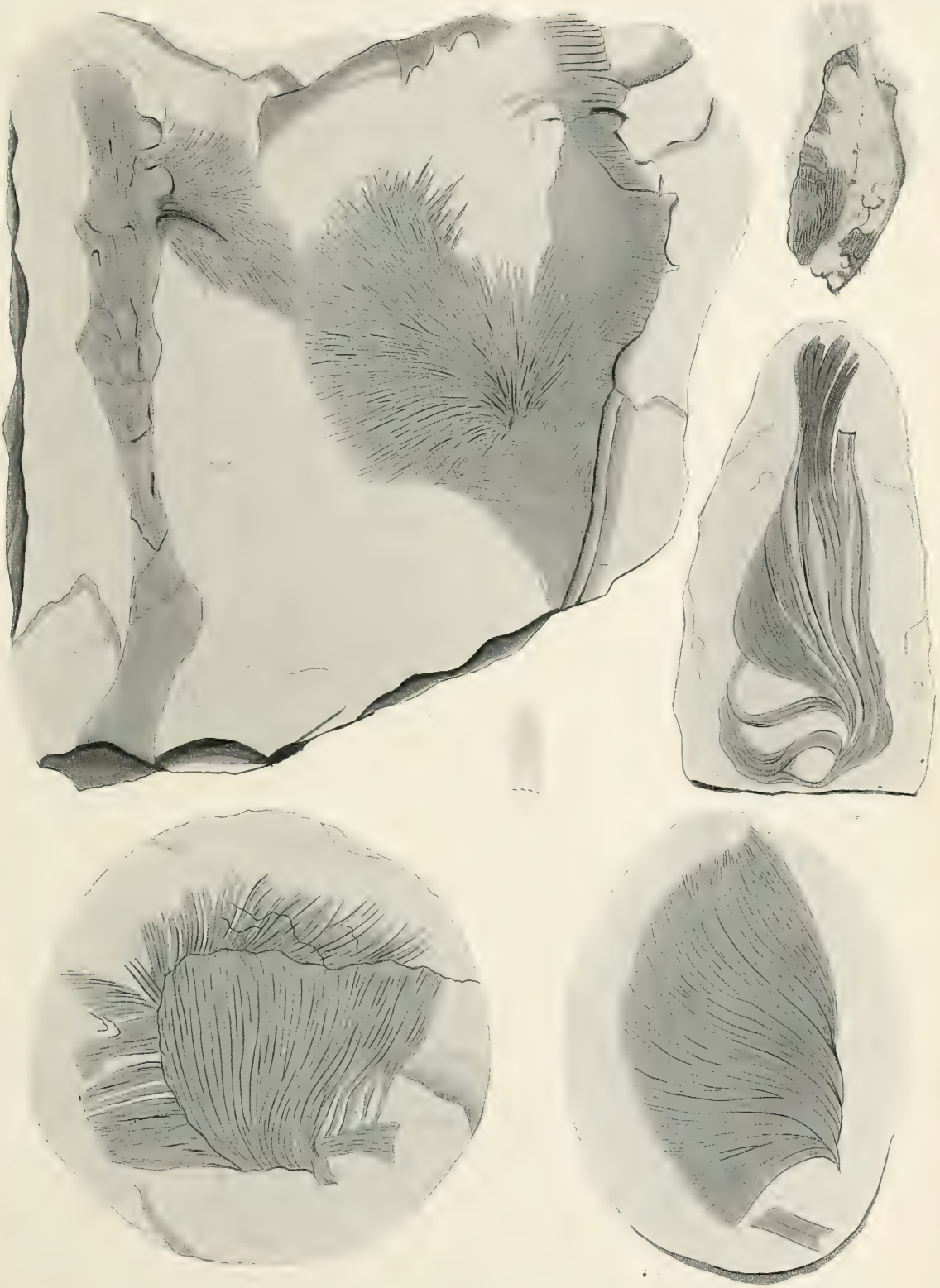

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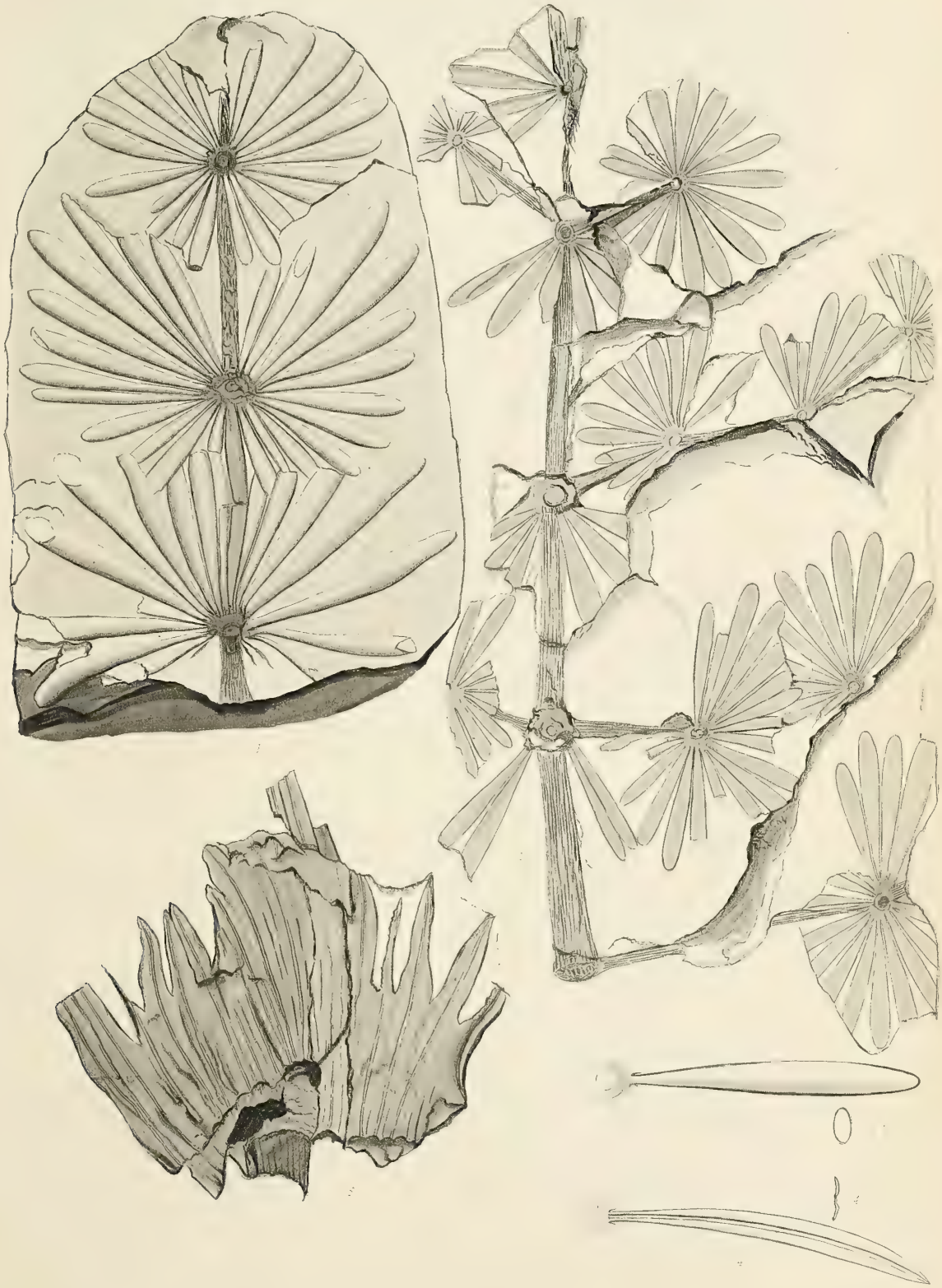

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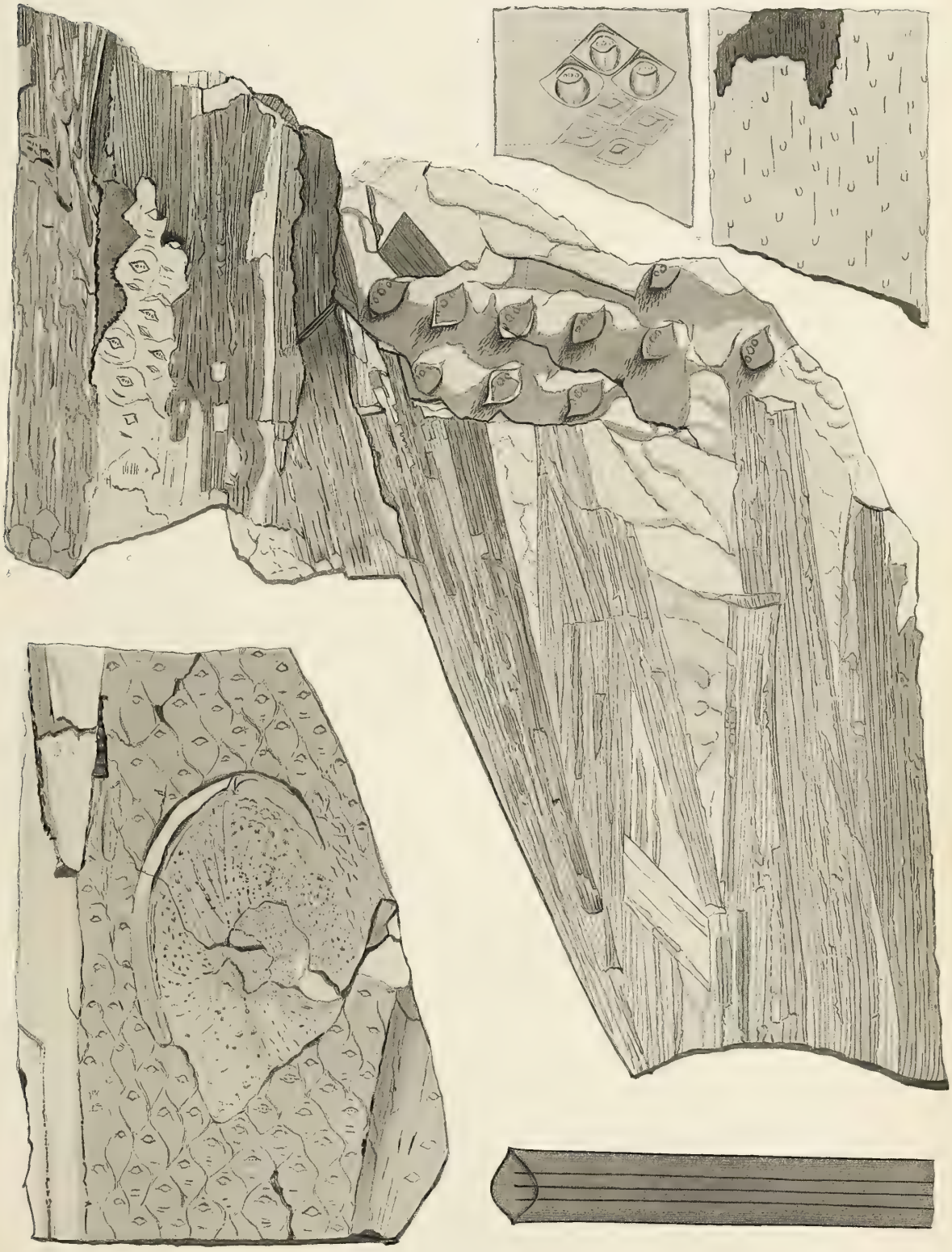

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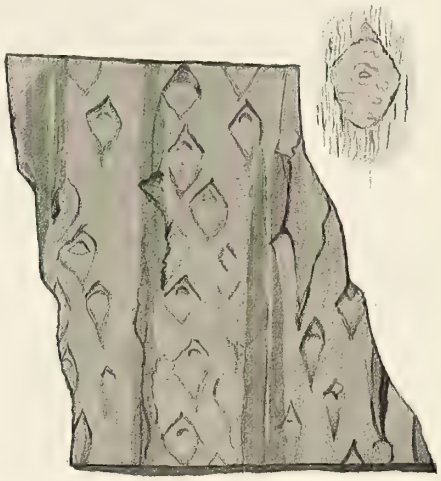

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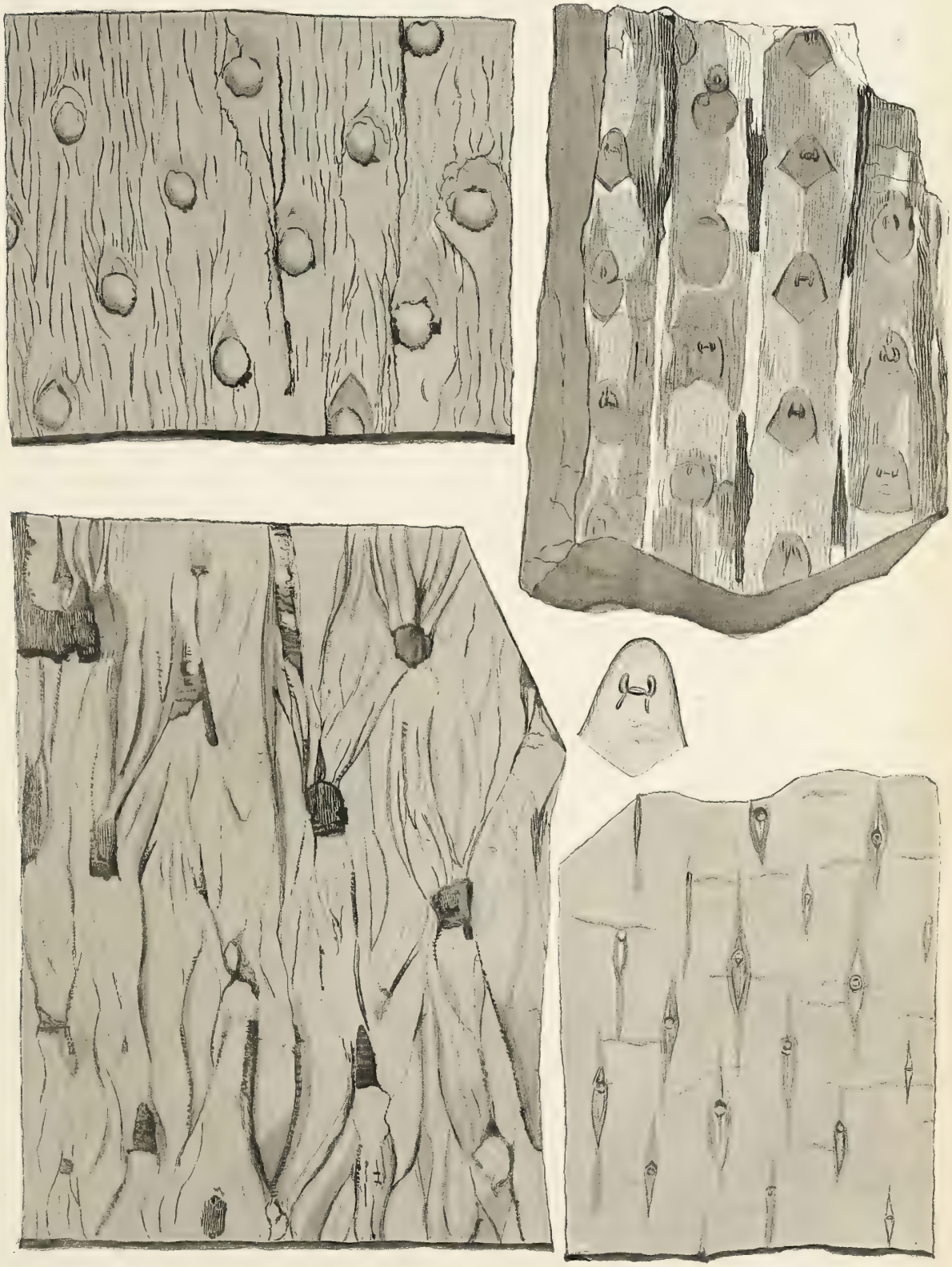

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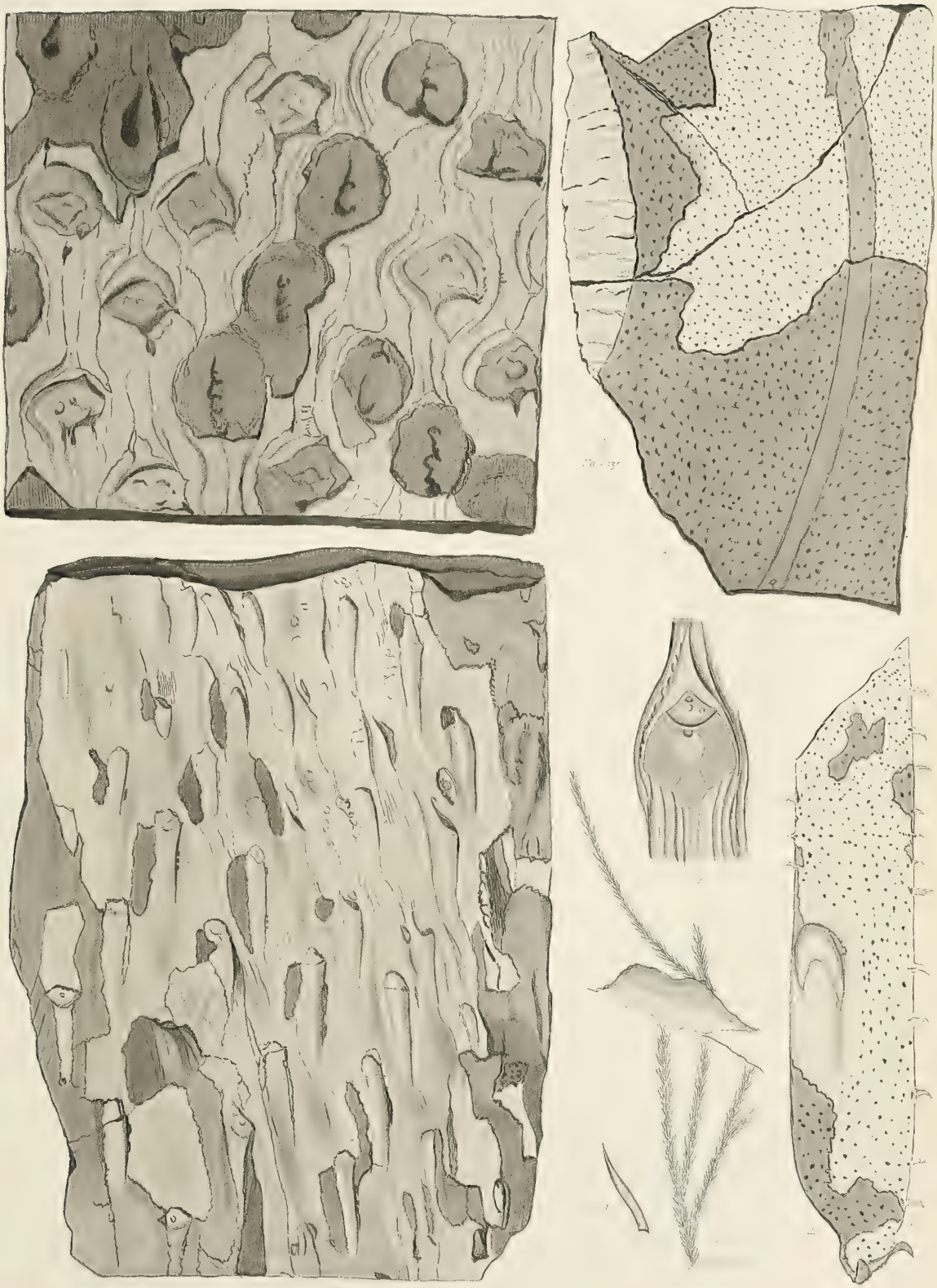

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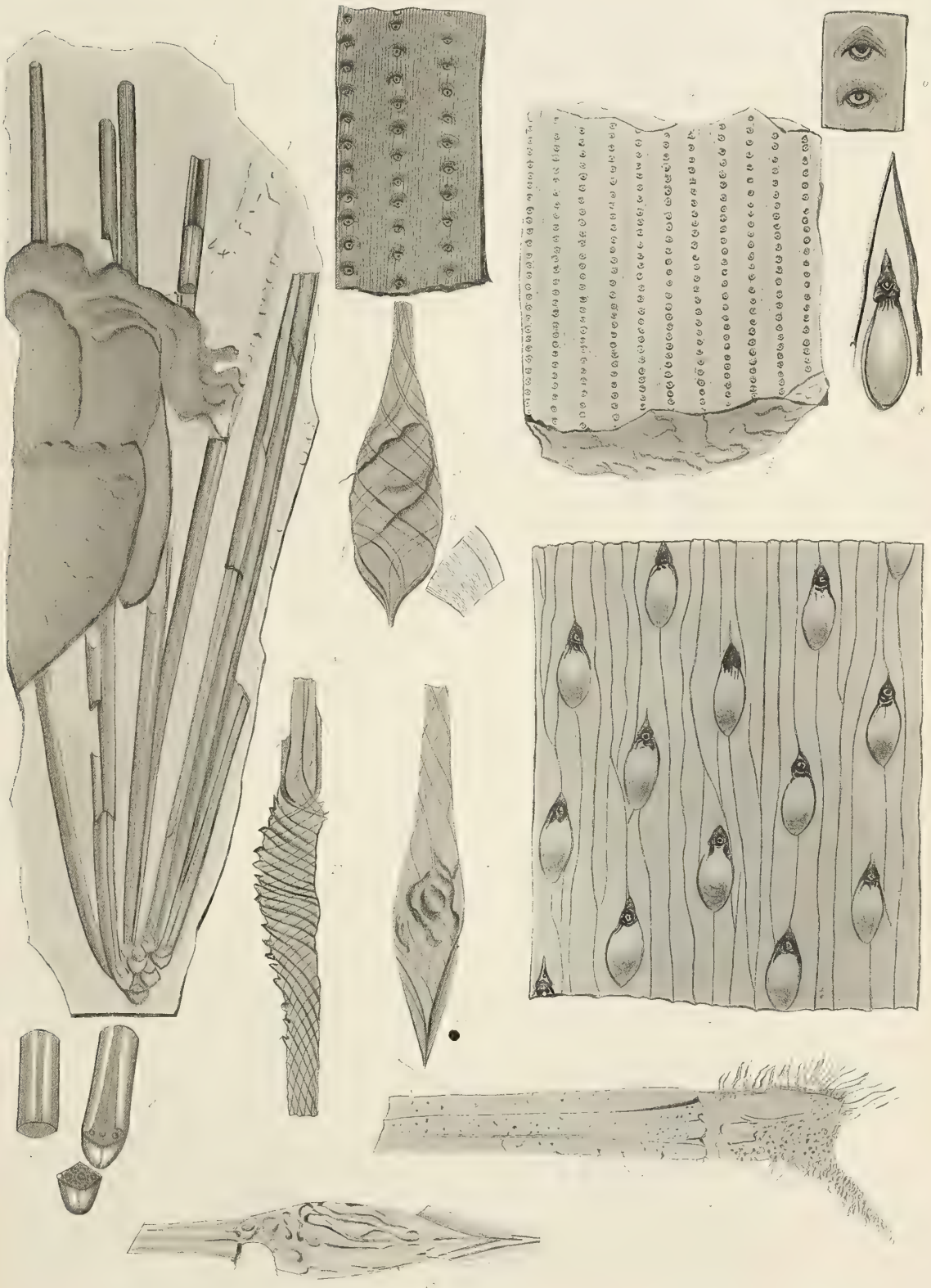

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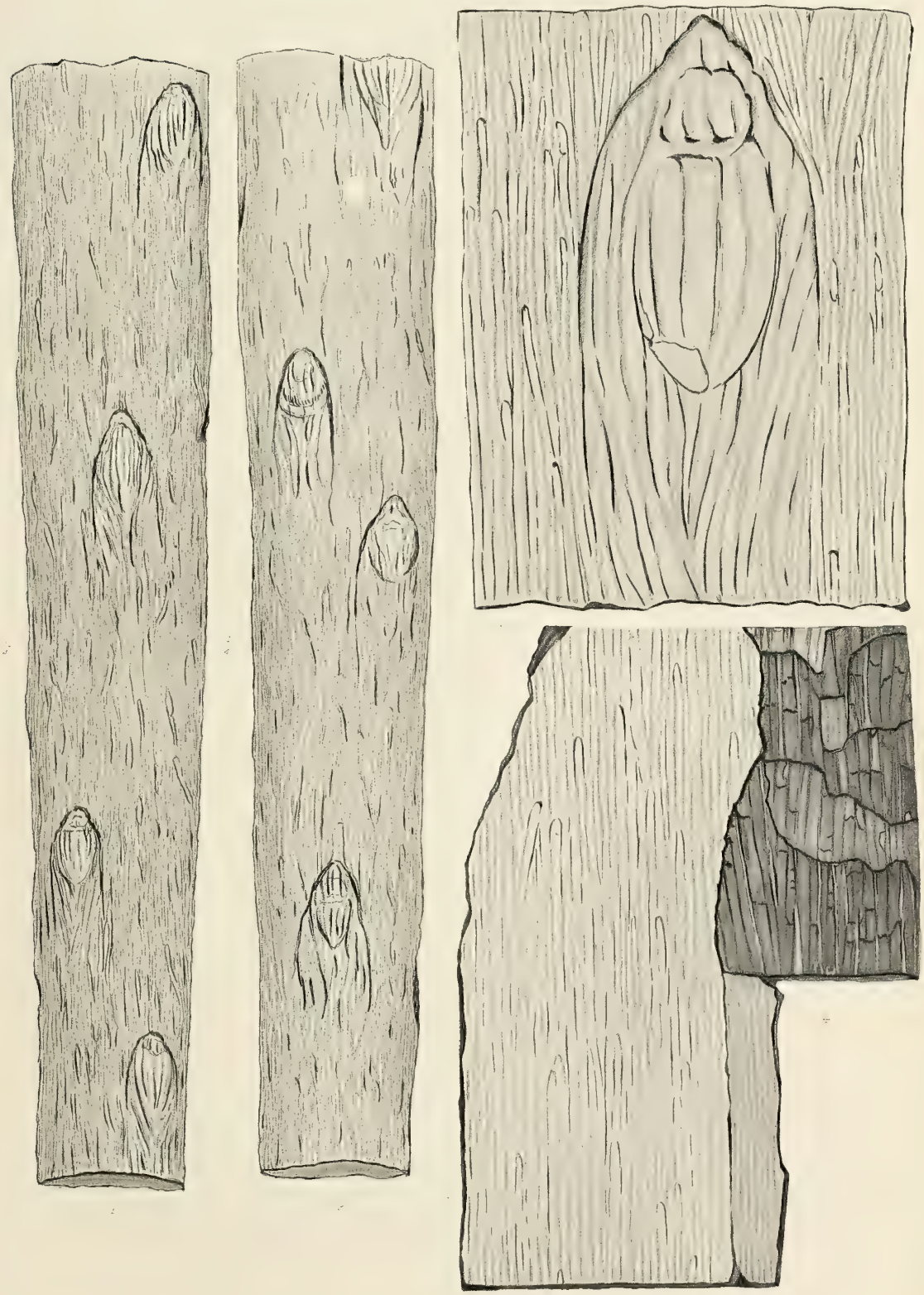
Fig. 3. Branch cicatrice of the same, natural size.

Fig 4. Part of the surface, showing rootlets in relative p sition, either naked, or with a carbonaceous pellicle.



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1. Compare Ancistrophyllum Göpp..

GEOLOGICAL SURVEY OF ILLINOIS

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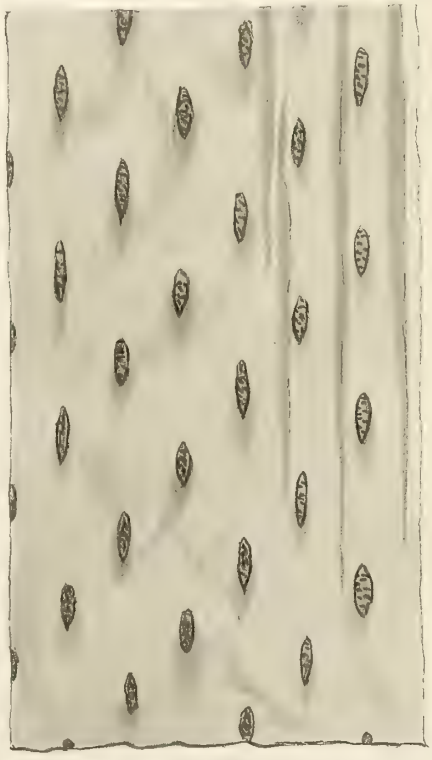

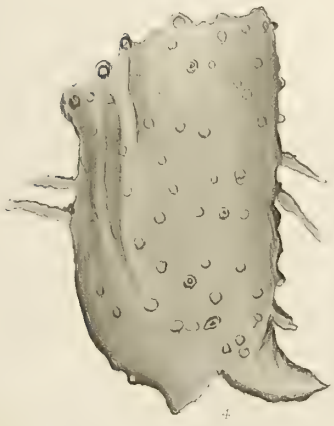

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